United States
Department of
Agriculture

Rural
Electrification
Administration

REA Bulletin
50-6 (D-806)

Specifications and Drawings for Underground Electric Distribution

SPECIFICATIONS FOR CONSTRUCTION FOR UNDERGROUND DISTRIBUTION SYSTEMS

Approved for Reprint — April 1988

Reprinted to include Revised Drawings dated 10/16/81

1. General

These specifications provide for the construction of underground distribution power facilities by the direct burial of cables, using either plowing methods or trenching, as specified by the owner.

All construction work shall be done in a thorough and workmanlike manner in accordance with the staking sheets, plans and specifications, and the construction drawings.

The 1973 Edition of the National Electrical Safety Code (ANSI C2-1973) shall be followed, except where local regulations are more stringent, in which case local regulations shall govern.

2. Storage of Material and Equipment

All material and equipment to be used in construction shall be stored so as to be protected from deteriorating effects of the elements. If outdoor storage cannot be avoided, the material and equipment shall be stacked on supports well above the ground line and protected from the elements as appropriate, and with due regard to public safety.

3. Handling of Cable

Cable shall be handled carefully at all times to avoid damage, and shall not be dragged across the ground, fences or sharp projections. Care shall be exercised to avoid excessive bending of the cable. The ends of the cable shall be sealed at all times against moisture with suitable end caps. Where it is necessary to cut the cable, the ends shall be terminated or sealed immediately after the cutting operation.

4. Plowing

When cables are to be installed by plowing, the plowing equipment shall be subject to the approval of the owner and the public authorities having jurisdiction over highway and road rights-of-way. The plow must be provided with a means to assure positive holddown of the plow blade to provide proper depth at all times.

The design of the plowshare shall be such that the cable passing through the plow will not be bent in a radius less than twelve times the outside diameter of the cable.

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The equipment shall be capable of extending the plow a minimum of six inches below the specified depths under all terrain conditions of plow utilization.

The equipment and construction methods used by the contractor shall be such as to cause minimum displacement of the soil. The slot made in the soil by the cable plows shall be closed immediately by driving a vehicle track, or wheel, over the slot or by other suitable means.

Starting and terminating points of the plowing operation shall be excavated prior to cable installation to reduce possible cable damage and to insure sufficient burial depth.

During the plowing operation, care is to be exercised to feed the cable or wire into the ground through the plow loosely and at minimum tension. Besides using proper equipment and construction methods, the contractor shall furnish competent supervision at all times at the side of plowing operations to assure compliance with these specifications.

If, during the plowing operation, the plow should strike a buried object or rock that would stop the equipment and necessitate removal of the plow from the ground, the plow shall be removed from the ground carefully and, if practical, without backing the plow. If it should be necessary to back the plow to remove it from the ground, the cable shall be uncovered a sufficient distance back for inspection by the owner to determine whether the cable or wire has been damaged.

The cable shall be inspected carefully by the contractor as it is payed out from the reel to be certain that it is free from visible defects. Every instance of damaged cable observed at any time--whether prior to installation, during installation, or when discovered by test or observation subsequent to installation in plant--shall be immediately called to the attention of the owner. Repair or correction of such damage shall be done promptly and in accordance with the written instruction of the owner. The location of any such repair shall be indicated on the staking sheet.

5. Special Requirements for Coordination between Owner and Contractor Where Cable Is To Be Installed by Plowing

The staking sheets shall be reviewed jointly in the field by the contractor and the owner prior to the start of construction. The contractor shall at that time propose any changes or clarifications he feels desirable. These changes, if approved by the owner, will be made and recorded on the staking sheets. No changes on the staking sheets shall be made by the contractor without the prior written approval of the owner. A representative of the owner shall

remain in the immediate vicinity of the plowing operations at all times and will consider and approve any acceptable changes proposed by the contractor. A representative of the owner will also inspect any damage to cable and approve acceptable methods of repair or correction of such damage in accordance with the provisions of these specifications.

In the event that rock is encountered during the plowing operation so that the buried cable cannot be installed to the required minimum depths in soil, the contractor shall determine for the owner the nature and extent of the rock encountered. Based on this information, the owner will determine whether the cable is to be rerouted, trenched in rock or a change made to aerial construction. This decision will be made promptly, and appropriate changes in units will be made on the staking sheets. Such changes shall be in writing, dated, and initialed by the owner.

Due to the necessity of making on-the-spot corrections and changes on staking sheets, it may not be possible for the owner to issue revised staking sheets to the contractor in all cases. When changes are made, dated, and initialed by the owner on any set of the contractor's staking sheets, it shall be the contractor's responsibility to transfer these changes to all other sets of staking sheets being used by the contractor for construction purposes.

The contractor shall provide a competent representative to work with the owner on the inventory and inspection of buried cable units. The inventory of buried cable shall be made as soon after the plowing operation as practical to avoid later disagreements on the quantity of cable installed when changes are required in the project.

6. Trenching

All trenching depths specified are minimum as measured from the final grade to the top surface of the cable. The routing shall be as shown on the staking sheets and plans and specifications unless conditions encountered are such that changes are necessary to accomplish the work. In such event, the owner shall be notified promptly. If rock or other difficult digging is involved, the contractor shall determine the nature and extent of the difficulty, and the owner will determine whether rerouting, rock trenching, plowing or other changes are necessary. Loose soil or crumbly rock will not be considered as "difficult digging." The trench widths specified are minimum and should be increased as necessary to obtain the required depths in loose soils.

Where trenches are intended for more than one cable, particular care must be taken to provide for extra depth and width to allow for soil falling into the trench during the laying of the first cables.

Care shall be exercised to minimize the likelihood of waterflow since this may cause trench damage and reduction in trench depth. When this occurs, the trench must be cleared to the specified depth before installing the cable.

All trenches shall follow straight lines between staked points as far as possible. Secondary and service trenches shall extend in a straight line from takeoff points wherever possible. The trenches shall be dug so that the bottom has a smooth grade. Large rocks, stones and gravel in excess of one inch shall be removed from the bottom of the trench. Where this cannot be done, a two-inch bed of sand or clean soil shall be placed in the bottom of the trench.

Construction shall be arranged so that trenches will be left open for the shortest practical time to avoid creating a hazard to the public and to minimize the likelihood of trench collapse due to other construction activity, rain, accumulation of water in the trench, etc.

7. Installing Cable

The cable shall be placed in the trench as soon after the trenching operation as feasible. Wherever possible, cable shall be payed out from the reel mounted on a moving vehicle or trailer. The reel shall be supported so that it can turn easily without undue strain on the cable. The cable shall be carefully placed in the trench by hand. All cable placement shall be done under constant supervision to be certain that no damage to the cable occurs.

The cable shall be inspected carefully by the contractor as it is removed from the reel in laying operations to be certain that it is free from visible defects. The owner shall decide upon corrective action when defects are discovered.

Where more than one cable is to be placed in a trench, the spacings required by the specifications shall be observed. Care must be taken that any soil falling into the trench during the laying of the first cables does not reduce the clearances of the last cable below that specified. Should this occur, the excess soil must be removed carefully by hand or with equipment that will not damage the installed cables.

Sufficient slack and in no case less than 24 inches shall be left at all risers, transformer pads, pedestals and terminal points so

that movements of cable after backfilling will not cause damaging strain on the cable or terminals. The cable trench shall be mechanically compacted 3'0" minimum from all riser poles, pads, pedestals and terminal points.

When a hole contains equipment with a metal tank, the concentric neutral cable shall be dressed carefully as shown in the drawings. It shall not be coiled at the bottom of the hole. The coiling of a concentric neutral cable around a metal equipment tank provides an undesirable electrical shield which prevents proper cathodic protection of the tank. Further, the concentric neutral cable shall be so positioned that it neither lies on nor rubs against the equipment tank.

At the location of submersible disconnect devices without a metal equipment tank in the hole, several feet of slack shall be left on each end of the primary cable. This slack may be left as a turn of cable around the inside of the hole liner.

The ends of all secondary cable terminated below ground shall be long enough to reach at least 12 inches above the top of the underground enclosure.

8. Minimum Bending Radius of Cable

The minimum bending radius of primary cable is 12 times the overall diameter of the cable. The minimum bending radius of secondary and service cable is six times the overall diameter of the cable. In all cases the minimum radius specified is measured to the surface of the cable on the inside of the bend. No cable bends shall be made within 6.0 inches of a cable terminal base.

9. Conduit

All exposed ends of conduit shall be plugged during construction to prevent the entrance of foreign matter and moisture into the conduit. Burrs or sharp projections which might injure the cable shall be removed. Riser shield or conduit shall extend at least 1.0 foot below grade at all riser poles. The minimum size of conduit, or riser guard with equivalent usable area, is as follows:

Primary Cables, 15 kV Polyethylene Concentric Neutral

Size AWG or MCM	No. of Cables	Conduit or Riser Shield Diameter (Inches)
2, 1, 1/0, 2/0, 3/0, 4/0	1	2
2, 1, 1/0, 2/0, 3/0, 4/0	2	3
2, 1, 1/0, 2/0	3	3
3/0, 4/0	3	3.5

Primary Cables, 25 kV Polyethylene Concentric Neutral

1, 1/0, 2/0, 3/0, 4/0	1	2
1	2	3
1/0, 2/0, 3/0, 4/0	2	3.5
1, 1/0, 2/0	3	3.5
3/0, 4/0	3	4

Secondary Cables, 600 Volt

2 through 2/0	3 or 4	2
Except 2/0	4	3
3/0 through 350	3 or 4	3
Except 350	4	3.5
400 and 500	3	3.5
400 and 500	4	4

10. Installation in Conduit or Duct

Where cable must be pulled through conduit or duct, the operation shall be performed in such a way that the cable will not be damaged from strain or dragging. The cable shall be lubricated with a suitable cable lubricant prior to pulling into conduit or duct.

In placing primary cables, the stress applied while pulling into ducts or during other pulling operations shall not exceed the least of the following:

a. Where a pulling eye is attached to the conductor, the maximum pulling strain in pounds shall not exceed .006 times the circular mil area for aluminum or .008 times the circular mil area for copper.

b. Where a basket grip is placed over the cable, the pulling strain shall not exceed the lesser of (1) that calculated in a above or (2) 1000 pounds. The cable under the cable grip and 1.0 foot preceding it shall be severed and discarded after the pulling operation.

c. In no case shall the maximum pulling tension exceed that recommended by the specific cable manufacturer.

d. At bends the maximum sidewall pressure recommended by the cable manufacturer shall not be exceeded.

11. Tagging of Cables at Termination Points

As the cables are laid they shall be identified and tagged. The identification shall be of a permanent type, such as that done with an embossing type tape writer on plastic or corrosion resistant metal tags. The tag shall be securely attached to the cable. Paper or cloth tags are not acceptable.

12. Splices

Cable splices shall be of the prefabricated type, of the correct voltage rating and shall be made in accordance with the splice manufacturer's instructions. Splices that depend solely on tape for a moisture barrier shall not be used.

Not more than one splice shall be permitted for each 2000 feet of cable installed unless authorized by the owner. No bends shall be permitted within 12 inches of the ends of the splice. The cable or circuit numbers and the exact location of all splices shall be noted on the staking sheets (as built).

13. Primary Cable Termination and Stress Cones

Prefabricated stress cones or terminations shall be installed in accordance with the manufacturer's instructions at all primary cable terminals. They shall be suitable for the size and type of cable that they are used with and for the environment in which they will operate. Any indication of misfit, such as a loose or exceptionally tight fit, shall be called to the owner's attention. The outer conductive surface of the termination shall be bonded to the system neutral.

14. Special Precautions for Cable Splices and Terminations

A portable covering or shelter shall be available for use when splices or terminations are being prepared and when prefabricated terminations are being switched. The shelter shall be used as necessary to keep rain, snow and windblown dust off the insulating surfaces of these devices. Since cleanliness is essential in the preparation and installation of primary cable fittings, care shall be exercised to prevent the transfer of conducting particles from the hands to insulating surfaces. Mating surfaces shall be wiped with a solvent such as denatured alcohol to remove any possible accumulation of dirt, moisture or other conducting materials. A

silicone grease should be applied afterwards in accordance with the manufacturer's recommendations. Whenever prefabricated cable devices are opened, the unenergized mating surfaces shall be lubricated with silicone grease before the fittings are reconnected.

15. Secondary and Service Connections

A suitable inhibiting compound shall be used with all secondary and service connections.

All secondary cable connections located below grade or in secondary pedestals shall be made with preinsulated secondary connector blocks. Diving bells with open terminals, insulating boots or moisture barriers that depend solely on tape are not acceptable.

All transformer secondary phase terminal connections shall be completely insulated. If the secondary phase terminals are threaded studs, the connection shall be made with a preinsulated secondary transformer connection block. If the transformer secondary phase terminals are insulated cable leads, connection shall be made with a preinsulated secondary connector block or with a secondary prefabricated splice when the transformer leads continue directly to the service.

If a transformer is so large that it must have secondary spades, the spades shall be taped or otherwise insulated. Boots used for insulation shall be taped so that they cannot be readily slipped off.

Secondary connections to terminals of pole-mounted transformers shall be made so that moisture cannot get inside the cable insulation. This may be accomplished by covering the terminals and bare conductor ends with an appropriate moisture sealant (item es in the List of Materials).

The secondary connections and insulation shall have accommodations for all future and existing services as shown on the plans and specifications.

16. Pedestals

Where required, pedestal stakes shall be driven vertically into the bottom of the trench before cables are placed, and shall be located as shown on the staking sheets. Pedestal posts and supporting stakes shall be in place before the cable is installed. All pedestals should be approximately at the same height above finished grade.

17. Inspection and Inventory of Buried Units

Before any backfilling operations are begun, the contractor and owner shall jointly inspect all trenches, cable placement, risers,

pedestal stakes, and other construction not accessible after backfilling, and an inventory of units shall be taken. If corrections are required, a second inspection shall be made after completion of the changes.

18. Backfilling

The first six inches of trench backfill shall be free from rock, gravel or other material which might damage the cable jacket. In lieu of cleaning the trench, the contractor may, at his option, place a two-inch bed of clean sand or soil under the cable and four inches of clean soil above the cable. Cleaned soil backfill when used shall contain no solid material larger than one inch. This soil layer shall be carefully compacted so that the cable will not be damaged.

Backfilling shall be completed in such a manner that voids will be minimized. Excess soil shall be piled on top and shall be well tamped. All rock and debris shall be removed from the site, and any damage to the premises repaired immediately.

Pieces of scrap cable shall not be buried in the trench as a means of disposal.

19. Equipment Pads

The site for the pad shall be on undisturbed earth adjacent to but not over the trench. The site shall be cleared of all debris and excavated to the specified depth. Gravel, sand or other acceptable self-draining material shall be added to the site and thoroughly compacted. The pad shall be installed at the specified elevation. Either precast concrete, poured-in-place concrete, or plastic pads may be used.

20. Transformers

Transformers shall be handled carefully to avoid damage to the finish and shall be positioned in accordance with the staking sheets and the plans and specifications. Only qualified and experienced personnel shall be allowed to make connections and cable terminations.

21. Equipment Enclosures

Excavations for transformer hole liners and other below-grade enclosures shall be made so as to disturb the surrounding earth as little as practical. Enclosures shall be installed with side walls plumb. When enclosures are of fiber, plastic, or other semiflexible material, backfilling should be done with covers in place and with careful tamping so as to avoid distortion of the enclosure. When installation is complete, the cover of the enclosure shall not be

lower than and not more than two inches higher than the grade specified by the owner. Soil in the immediate vicinity shall be tamped and sloped away from the enclosure. At the owner's option the excess soil shall be removed from the site or spread evenly over the surface of the ground to the satisfaction of the owner.

22. Warning Signs

Each equipment enclosure shall display a warning sign placed so that it is visible to anyone attempting entry to the enclosure.

23. Submersible Type and Direct-Buried Type Equipment with Tank Coatings

Extreme care shall be taken in handling and installing submersible and direct-buried type transformers and other equipment with tank coatings to prevent damage to the coating. Before setting the equipment in place, the tank shall be inspected carefully for scratches, pinholes or other flaws in the coating. Any defects that are found shall be brought to the attention of the owner and repaired in accordance with his instructions before the equipment is installed.

24. Sacrificial Anodes

Sacrificial anodes specified shall be installed with backfill package intact and connecting leads positioned for proper connection after the equipment is in place. Anodes shall neither be moved, positioned, nor lifted by pulling on the connecting leads.

Each anode installation for direct-buried transformers shall be tested jointly by the contractor and the owner before the transformer is energized. The test will consist of measuring the transformer tank potential with respect to a copper-copper sulfate reference electrode. The reading should indicate a negative voltage with a magnitude greater than 0.9 volts. If the magnitude of the negative voltage is less than 0.9 volts, the transformer is to be excavated, and the anode and all anode lead wires are to be inspected and corrected or replaced as necessary.

The anode installation test is to be made after the transformer has been backfilled, preferably for at least six days. A test lead shall be provided as follows:

> A six-inch insulated lead shall be electrically connected to the direct-buried transformer tank. This connection shall be arranged so that it will not be disturbed by tension on the lead. The free end of this lead shall be connected to another insulated lead which extends above grade after backfilling. The connection between the two leads shall be waterproofed and shall be a type that can

be easily disconnected by pulling on the aboveground lead. (Example: Banana plug and jack waterproofed with electrician's putty.) The leads shall be positioned in such a manner to keep them well clear of the primary neutral.

Further information on the selection and installation of sacrificial anodes can be found in REA Bulletins 161-23 and 61-11.

25. Grounding

All neutral conductors, ground electrodes, sacrificial anodes and groundable parts of equipment shall be interconnected, except that the neutral conductor shall not be connected to the tank of direct-buried transformers. All interconnections shall be made as shown on the construction drawings. A galvanized steel ground rod with minimum dimensions of 3/4-inch by 8.0 feet shall be installed at all equipment locations as shown in the construction drawings and at all cable splices and taps.

26. Cable Location Markers

Location of permanent cable markers shall be as shown on the staking sheets.

27. Cable Acceptance Tests

a. Continuity: After installation of the cable and prior to the high potential test specified below, the contractor and the owner shall jointly perform a simple continuity test on the system. This can easily be accomplished by grounding the conductor at the source and checking for continuity from the end of each tap with an ohmmeter or with a battery and ammeter.

b. High Potential: After successful continuity tests, the contractor and the owner jointly shall perform high potential tests on each longth of cable in the system, with terminations in place but disconnected from the system.

The installation shall withstand for a minimum of five minutes a dc test potential as follows:

600-Volt Secondary URD Cable
XLPE Insulation

Size AWG	Insulation Thickness Inches	Field dc Acceptance Test Voltage
8-2	0.060 - 0.062	10.8 kV
1-4/0	0.078 - 0.080	13.2 kV

Primary URD Cable
XLPE and HMW Poly

Rated Voltage	Insulation Thickness Inches	Field dc Acceptance Test Voltage
15 kV	.175	52.8 kV
25 kV	.260	78.0 kV

The voltage may either be increased continuously or in steps to the maximum test value.

(1) If increased continuously, the rate of increase of test voltage should be approximately uniform and increasing to maximum voltage in not less than 10 seconds and in not more than approximately 60 seconds.

(2) If applied in steps, the rate of increase of test voltage from one step to the next should be approximately uniform. The duration at each step shall be long enough for the absorption current to attain reasonable stabilization (one minute minimum). Current and voltage readings should be taken at the end of each step duration. The number of steps should be from five to eight.

Warning:

A hazardous voltage may still exist on the cable after the above testing has been completed. Therefore, before handling the cable, the conductor shall be grounded to permit any charge to drain to earth.

I N D E X

UG9A, UG9AB, UG9A-1, UG9A-1B, UG9A-2, UG9A-2B	Single-phase pole type dead front transformer in pad-mounted enclosure
UG9A	Single termination transformer with internal fuse
UG9AB	Single termination transformer with internal fuse and secondary breakers
UG9A-1	Two termination transformer with internal fuse
UG9A-1B	Two termination transformer with internal fuse and secondary breakers
UG9A-2	Single termination transformer with fused loadbreak elbow
UG9A-2B	Single termination transformer with fused loadbreak elbow and secondary breakers
UG10, UG10B, UG10-1, UG10-1B	Single-phase pole type transformer with sectionalizing in pad-mounted enclosure
UG10	Transformer with internal fuse
UG10B	Transformer with internal fuse and secondary breakers
UG10-1	Transformer with fused loadbreak elbow
UG10-1B	Transformer with fused loadbreak elbow and secondary breakers
UG11, UG11B, UG11-1, UG11-1B	Single-phase submersible transformer with external switching provision
UG11	Transformer with internal fuse
UG11B	Transformer with internal fuse and secondary breakers
UG11-1	Transformer with fused loadbreak elbow
UG11-1B	Transformer with fused loadbreak elbow and secondary breakers
UG17, UG17 , UG17-1, UG17-1B	Three-phase pad-mounted transformer (radial feed)
UG 7	Transformer with internal fuse
UG 7B	Transformer with internal fuse and secondary breakers

UG17-1	Transformer with fused loadbreak elbows
UG17-1B	Transformer with fused loadbreak elbows and secondary breakers
UG17-2, UG17-2B	Three-phase pad-mounted transformer (loop feed)
UG17-2	Transformer with internal fuse
UG17-2B	Transformer with internal fuse and secondary breakers
UG20, UG20-1	Single-phase direct-buried transformer
UG20	Transformer with metallic tank
UG20-1	Transformer with nonmetallic tank
UG21, UG21-1, UG22, UG22-1	Single-phase trench-lay direct-buried transformer
UG21	Single termination transformer with metallic tank
UG21-1	Single termination transformer with nonmetallic tank
UG22	Two termination transformer with metallic tank
UG22-1	Two termination transformer with nonmetallic tank

Secondary Assemblies:

UJ1-, UJ2-	Secondary connector blocks
UK5	Secondary assembly, underground cable
UK6	Secondary assembly, underground cable

Miscellaneous Assemblies:

UM-1	Concrete pad assembly
UM1-2, UM1-3, UM1-4	Plastic pad assemblies

UM1-2	Plastic pad
UM1-3	Plastic pad with anchor mounting
UM1-4	Plastic box pad
UM2, UM2A	Single-phase cable terminal pole with distribution valve arrester, overhead source
UM2	Single distribution valve arrester
UM2A	Two distribution valve arresters in parallel, 7.2/12.5 kV only
UM2-1A	Single-phase cable termination on existing transformer pole
UM2-2, UM2-2A	Single-phase terminal pole, underground source
UM2-2	Single distribution valve arrester
UM2-2A	Two distribution valve arresters in parallel, 7.2/12.5 kV only
UM2-3, UM2-3A	Three-phase overhead source, single-phase underground with combination cutout and arrester
UM2-3	Single distribution valve arrester
UM2-3A	Two distribution valve arresters in parallel, 7.2/12.5 kV only
UM2-4	Single-phase cable terminal pole with intermediate arrester, overhead source
UM2-5, UM2-5A	Three-phase cable terminal pole with distribution valve arresters, crossarm construction
UM2-5	Single distribution valve arrester per phase
UM2-5A	Two distribution valve arresters in parallel per phase, 7.2/12.5 kV only
UM2-5-1	Three-phase cable terminal pole with distribution valve arresters, brackets and crossarm construction

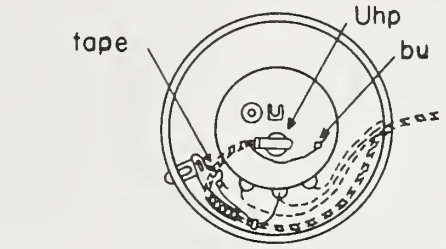
UM2-6	Three-phase cable terminal pole with intermediate arresters, overhead source, crossarm construction
UM2-7	Three-phase cable terminal pole, underground source
UM3-3	Three-phase crossarm construction, three sectionalizing cutouts
UM3-02 to UM3-30	Single-phase sectionalizing assemblies, pole or pad-mounted
UM3-02A to UM3-30A	Single-phase sectionalizing assemblies, submersible
UM3-1, UM3-2, UM6-2, UM6-2A, UM6-3, UM6-5, UM6-10	Primary cable terminations
UM3-14, UM3-15	Single-phase sectionalizing assembly, pole or pad-mounted
UM3-16	Single-phase sectionalizing assembly, submersible
UM3-40, UM3-41	Single-phase sectionalizing installation underground to underground, crossarm construction
UM3-40	Recloser assembly
UM3-41	Sectionalizer assembly
UM3-42, UM3-42A, UM3-43, UM3-43A	Three-phase, overhead source single-phase underground with recloser or sectionalizer
UM3-42	Recloser assembly with single distribution valve arrester
UM3-42A	Recloser assembly with two distribution valve arresters in parallel
UM3-43	Sectionalizer assembly with single valve arrester
UM3-43A	Sectionalizer assembly with two distribution valve arresters in parallel
UM3-44, UM3-45	Single-phase pad-mounted sectionalizer or recloser

UM3-44	Recloser assembly
UM3-45	Sectionalizer assembly
UM3-46	Three single-phase pad-mounted reclosers
UMS3-1-()	Single-phase pad-mounted sectionalizing assembly
UMS3-3-()	Three-phase pad-mounted sectionalizing assembly
UM5	7.2/12.5 kV single-phase secondary cable terminal pole
UM5-5	Guide for secondary cable terminal pole, multiple services
UM6-4, UM6-6, UM6-8, UM6-9, UM6-11, UM6-12, UM6-18	Miscellaneous assemblies
UM7-1	Single-phase pole-mounted regulator with bypass switching function, underground to underground
UM8	Meter installation guide, underground source
UM8-1, UM8-2	Meter installation guide, underground source with current transformer(s)
UM8-1	Single current transformer connection
UM8-2	Double current transformer connection
UM9-1	Single-phase pad-mounted reactor
UM10	Cable crossing protection assembly
UM11	Underground cable and pipeline crossing with interference bond
UM11-1	Underground cable and pipeline crossing with sacrificial anode
UM12	Warning sign - UNDERGROUND POWER CABLES

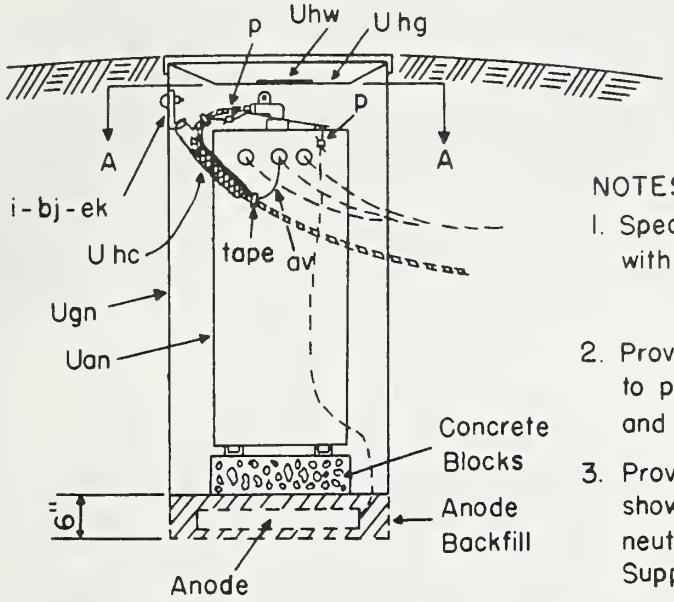
UM12-1	Warning sign guide - DANGER
UM12-2	Warning sign guide - CAUTION
UM26	Sacrificial anode for submersible transformer
UM27	Sacrificial anode for underground primary cable
UM33	Multiphase pad-mounted sectionalizing assemblies 7.2/12.5 kV, 200 ampere maximum
UM40-()	Multipoint terminations
UM45-1, UM45-2, UM45-3, UM45-4	Primary and secondary cable splices
UM45-1	Through splice
UM45-2	Tee splice
UM45-3	Secondary splice
UM45-4	Through splice

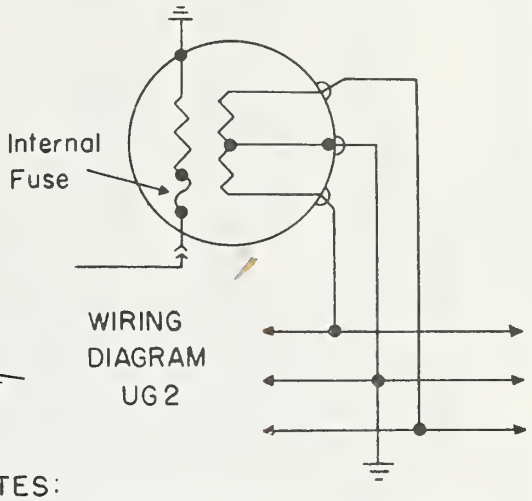
Trench Assemblies:

UR2 to UR2-2	Trenches for direct-burial cables
UR2-3 to UR2-5	Trenches for direct-burial cables



SECTION "A-A"





WIRING DIAGRAM UG2

NOTES:

1. Specify UM26, sacrificial anode for use with transformer having steel tank.
2. Provide sufficient primary neutral slack to permit ready disconnection of elbow and mounting on parking stand.
3. Provide slack in primary cable as shown. Dress cable so that concentric neutral does not rub against tank. Support cable as shown.

Designate as:

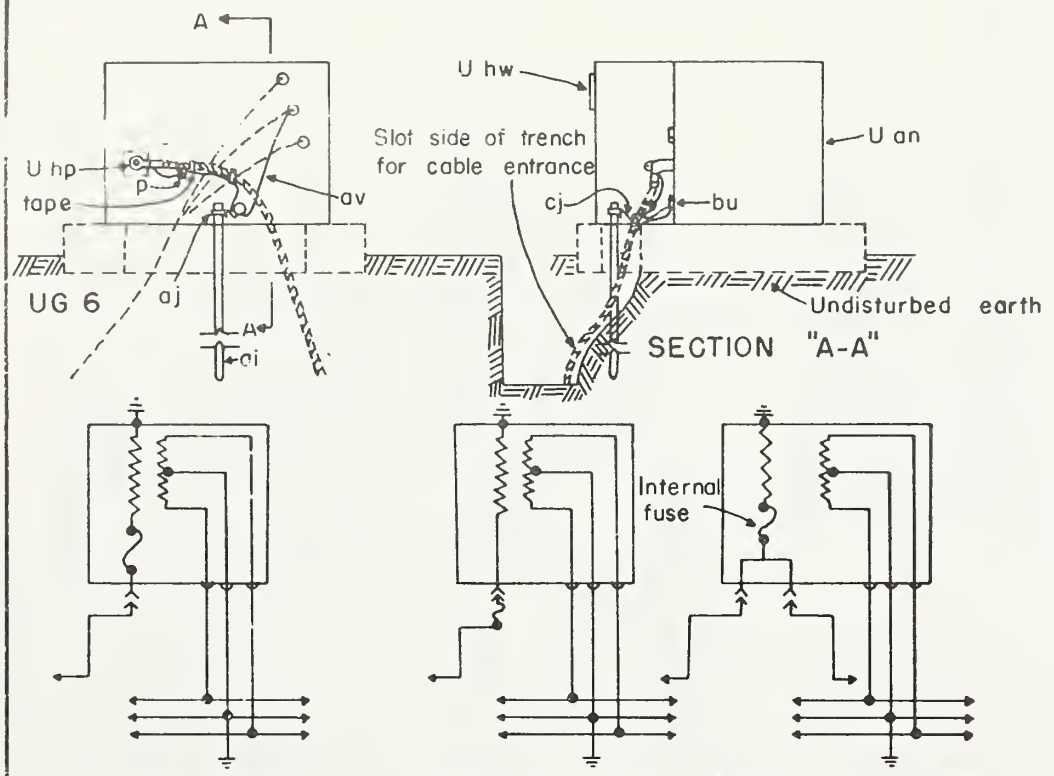
Transformers without secondary breakers	Transformers with secondary breakers	
UG 2	UG 2B	Unit with internal fuse
UG 2-1	UG 2-1B	Unit with fused load break elbow

ITEM	NO.	MATERIAL	ITEM	NO.	MATERIAL
i	1	Bolt, carriage, 5/8" x required length	Uan	1	Transformer, submersible type, with
p		Connectors, as required			single load break bushing (UG2-1 & UG2-1B)
av		Jumpers, as required			
bj	1	Guy hook	Ugn	1	Enclosure with cover
bu	1	Connector, equipment ground	Uhc	1	Cable support
ek	1	Locknut	Uhp	1	Elbow, load break, fused (UG2-1 & UG2-1B)
Uan	1	Transformer, submersible type, with	Uhw	1	Sign, warning
		single load break bushing and internal			Tape, as required
		fuse (UG 2 & UG2B)		2	Concrete blocks, 8" x 8" x 16"
Uhp	1	Elbow, load break (UG 2 & UG2B)			
Uhg	1	Anti-tamper shield			

SINGLE - PHASE SUBMERSIBLE TRANSFORMER

Dec. 1974

UG 2, UG2B
UG2-1, UG2-1B



ITEM	NO.	MATERIAL
p		Connectors, as required
av		Jumpers, as required
bu	1	Connector, equipment ground
U an	1	Transformer, pad-mounted, single primary load break bushing and internal fuse (UG 6 & UG6B)
U an	1	Transformer, pad-mounted, single primary load break bushing (UG 6-1 & UG 6-1B)
U an	1	Transformer, pad-mounted, two primary load break bushings and internal fuse (UG7 & UG7B)
U hp	1	Elbow, load break (UG 6 & UG 6B)
U hp	2	Elbow, load break (UG 7 & UG 7B)
U hp	1	Elbow, load break, fused (UG6-1 & UG6-1B)
U hw	1	Sign, warning
		Tape, as required
ai	1	Rod, ground, galvanized steel (for cathodic protection)
aj	1	Clamp, ground rod
cj		Ground wire, as required

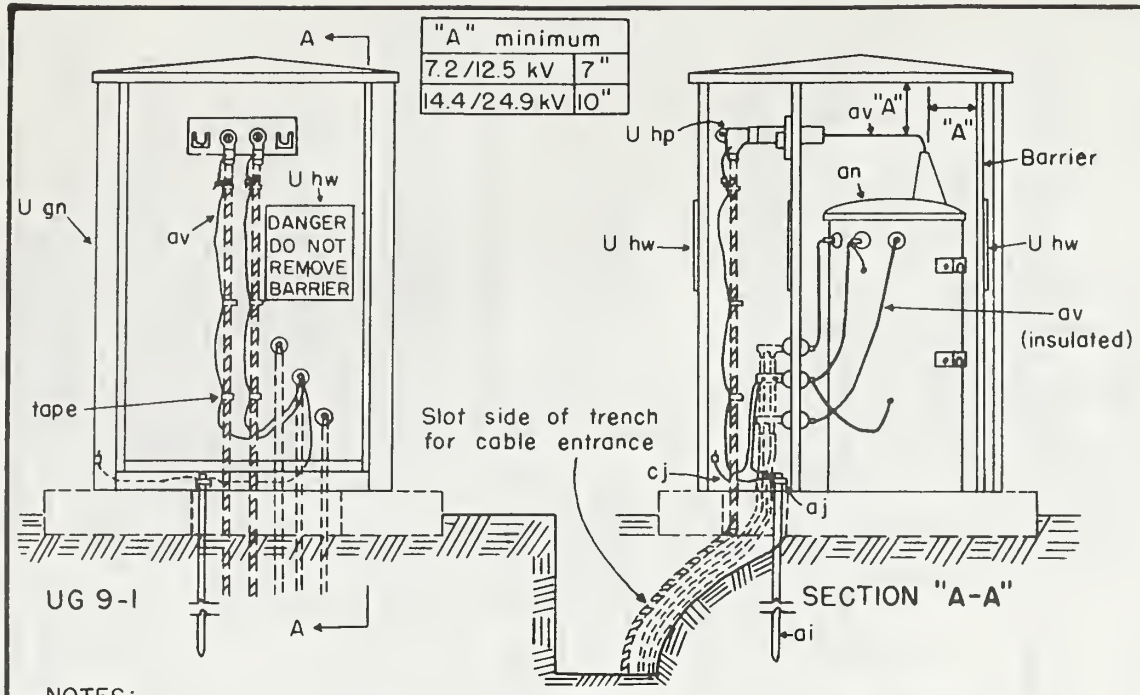
NOTE:
Provide sufficient primary neutral pigtail and cable slack to permit ready disconnection of elbow and mounting on parking stand.

Designate as:

Transformer without secondary breakers	Transformer with secondary breakers	
UG 6	UG 6B	Single termination type with internal fuse
UG 6-1	UG 6-1B	Single termination type with fused load break elbow
UG 7	UG 7B	Two termination type with internal fuse

SINGLE - PHASE PAD-MOUNTED TRANSFORMER

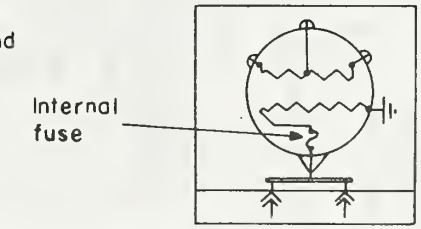
Dec. 1974		UG6, UG6B, UG 6-1 UG6-1B, UG7, UG7B



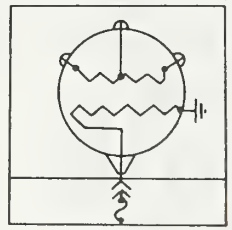
ITEM	NO.	MATERIAL
p		Connectors, as required
an	1	Transformer, pole type, single primary bushing and internal fuse (UG9, UG9B, UG9-1 & UG9-1B)
an	1	Transformer, pole type, single primary bushing (UG9-2, UG9-2B)
av		Jumpers, as required
U gn		Enclosure w/bushings, as required
U hp	1	Elbow, load break (UG9, UG9B)
U hp	2	Elbow, load break (UG9-1 & UG9-1B)
U hp	1	Elbow, load break, fused (UG9-2, UG9-2B)
U hw	3	Sign, warning
		Tape, as required
ai	1	Rod, ground, galvanized steel (for cathodic protection)
aj	1	Clamp, ground rod
cj		Ground wire, as required

NOTES:

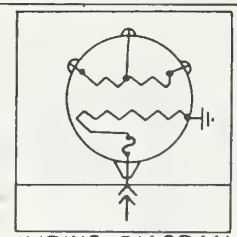
1. Provide sufficient primary neutral pigtail and cable slack to permit ready disconnection of elbow and mounting on parking stand.
2. Dimension "A" is from enclosure to nearest live part.



WIRING DIAGRAM UG 9-1



WIRING DIAGRAM UG 9-2



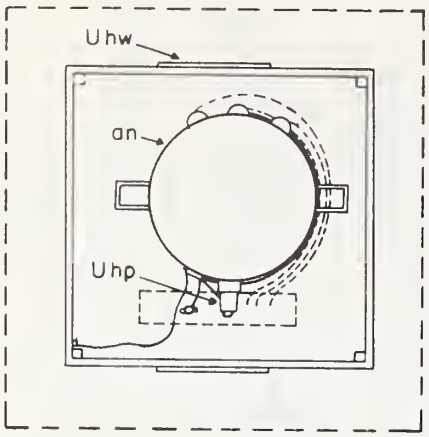
WIRING DIAGRAM UG 9

Transformer without secondary breakers	Transformer with secondary breakers	
UG 9	UG 9B	Single termination type with internal fuse
UG9-1	UG9-1B	Two termination type with internal fuse
UG 9-2	UG9-2B	Single termination type with fused load break elbow

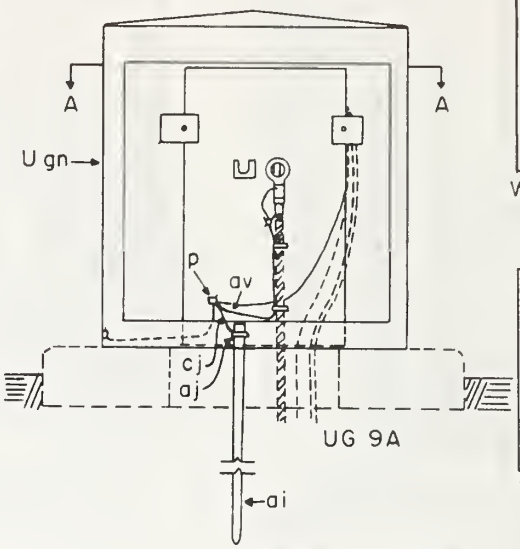
SINGLE-PHASE POLE TYPE TRANSFORMER IN PAD-MOUNTED ENCLOSURE

Dec. 1974

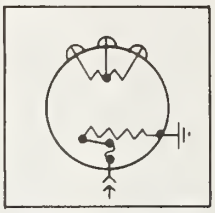
UG9, UG9B, UG9-1, UG9-1B
UG9-2, UG9-2B



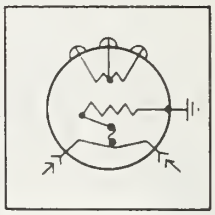
SECTION "A-A"



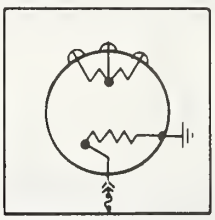
UG 9A



WIRING DIAGRAM
UG 9A



WIRING DIAGRAM
UG 9A-1



WIRING DIAGRAM
UG 9A-2

NOTES:

1. Pravide sufficient primary neutral slack to permit ready disconnection of elbow ond maunting on porking stand.

2. Anchor tronsformer to pad or enclosure.

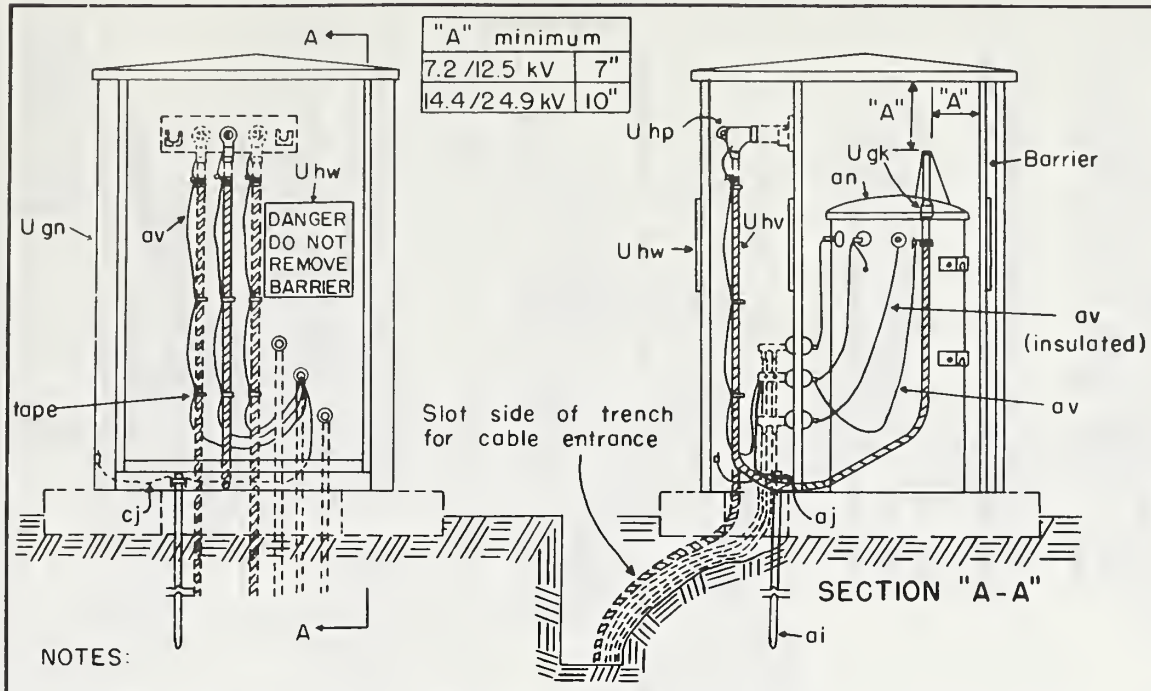
Designate as:

Tronsformers without secondary breakers	Transformers with secondory breokers	
UG 9A	UG 9AB	Single terminotion type with internol fuse
UG 9A-1	UG 9A-1B	Two terminotion type with internol fuse
UG 9A-2	UG 9A-2B	Single terminotion type with fused lood break elbow

ITEM	NO.	MATERIAL	ITEM	NO.	MATERIAL
p		Connectors, as required	ov		Jumpers, as required
on	1	Tronsformer, pole type, dead front, with			
		single load break bushing ond internol	Ugn	1	Enclosure
		fuse (UG 9A & UG 9AB)	Uhp	1	Elbaw, lood breok (UG 9A, UG 9AB)
on	1	Transformer, pole type, dead front, with			
		twa load break bushings and internol	Uhp	2	Elbow, load break (UG 9A-1 & UG 9A-1B)
		fuse (UG 9A-1 & UG 9A-1B)	Uhp	1	Elbow, lood break, fused (UG 9A-2,
an	1	Transformer, pole type, dead front, with			UG 9A-2B)
		single load break bushing (UG 9A-2 &	Uhw	2	Sign, worning
		UG 9A-2B)			Tape, as required
			ai	1	Rod, graund, galvanized steel (for
					cathodic protection)
cj		Graund wire, as required	aj	1	Clamp, ground rod

SINGLE-PHASE POLE TYPE DEAD FRONT TRANSFORMER IN PAD-MOUNTED ENCLOSURE

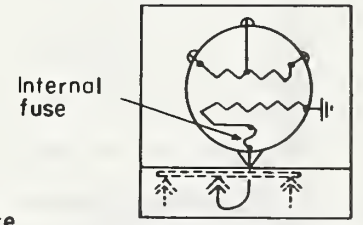
Dec. 1974		UG 9A, UG 9AB, UG 9A-1, UG 9A-1B, UG 9A-2, UG 9A-2B



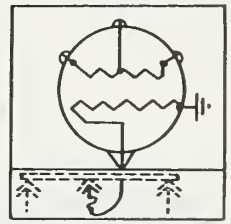
ITEM	NO.	MATERIAL
p		Connectors, as required
an	1	Transformer, pole type, single primary bushing and internal fuse (UG 10 & UG 10B)
an	1	Transformer, pole type, single primary bushing (UG 10-1 & UG 10-1B)
av		Jumpers, as required
Ugk	1	Primary termination, indoor
Ugn	1	Enclosure
Uhp	1	Elbow, load break (UG 10 & UG 10B)
Uhp	1	Elbow, load break, fused (UG 10-1 & UG 10-1B)
Uhv	1	Primary cable jumper, length as req'd.
Uhw	3	Sign, warning
		Tape, as required
ai	1	Rod, ground, galvanized steel (for cathodic protection)
aj	1	Clamp, ground rod
cj		Ground wire, as required

NOTES:

1. Provide sufficient primary neutral pigtail and cable slack to permit ready disconnection of elbow and mounting on parking stand. Train cables as shown.
2. Multipoint termination must be specified separately. See drawing UM 40.
3. Load break elbows and fused load break elbows for sectionalizing purposes are not part of this assembly unit. They should be specified separately.
4. Dimension "A" is from enclosure to nearest live part.



WIRING DIAGRAM
UG 10



WIRING DIAGRAM
UG 10-1

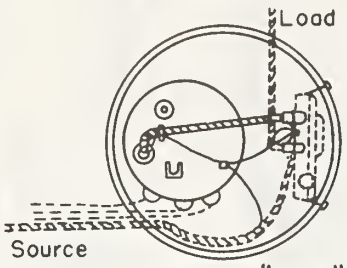
Designate as:

Transformer without secondary breakers	Transformer with secondary breakers	
UG 10	UG 10B	Unit with internal fuse
UG 10-1	UG 10-1B	Unit with fused load break elbow

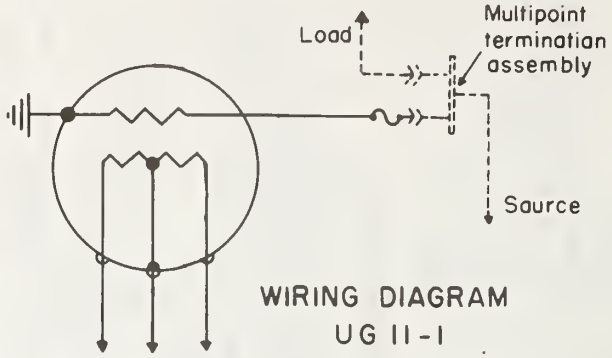
SINGLE-PHASE POLE TYPE TRANSFORMER WITH SECTIONALIZING IN PAD-MOUNTED ENCLOSURE

Dec. 1974

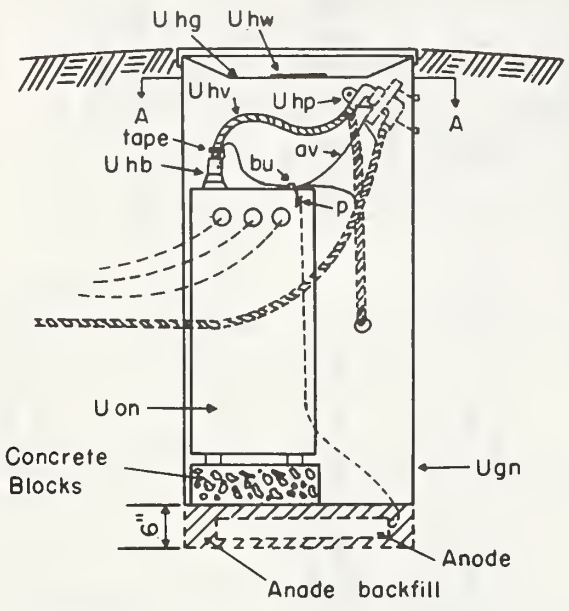
UG10, UG10B
UG 10-1, UG 10-1B



SECTION "A-A"



WIRING DIAGRAM
UG 11-1



NOTES:

1. Specify UM26, sacrificial anode for use with transformer having steel tank.
2. Multipoint termination must be specified separately. See drawing UM 40.
3. Provide sufficient primary neutral slack to permit ready disconnection of elbow and mounting on parking stand.
4. Provide slack in primary cable as shown. Dress cable so that concentric neutral does not rub against tank.
5. Interconnect all concentric neutrals, multipoint terminator, transformer tank and neutral.
6. Non-load break elbow (U hp) and bushing may be used in place of primary lead connector (U hb).

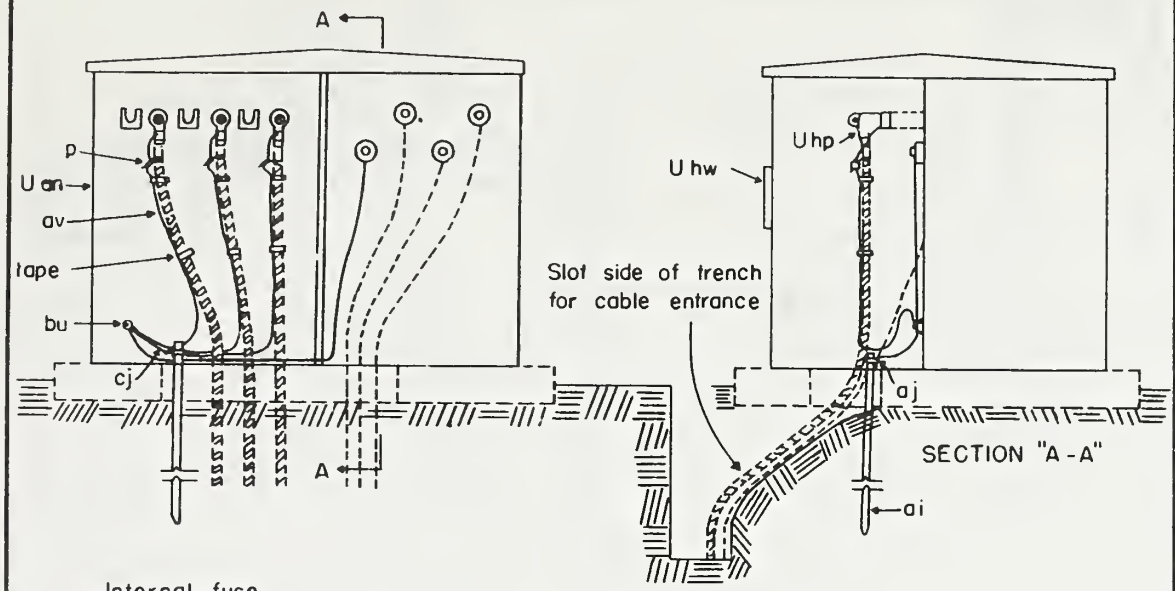
Designate as:

Transformers without secondary breakers	Transformers with secondary breakers	
UG 11	UG 11B	Unit with internal fuse
UG 11-1	UG 11-1B	Unit with fused load break elbow

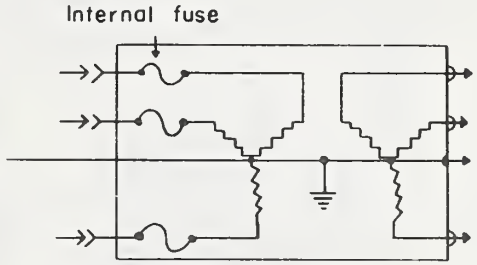
ITEM	NO.	MATERIAL	ITEM	NO.	MATERIAL
p		Connectors, as required	U hb	1	Coble lead connector, primary
av		Jumpers, as required	U hp	1	Elbow, lood break (UG 11 & UG11B)
bu	1	Connector, equipment ground			
U an	1	Tronsformer, submersible type, with	U hp	1	Elbow, load break, fused (UG 11-1 & UG 11-1B)
		single bushing well and internal			
		fuse (UG 11 & UG 11B)	U hv		Primary coble jumper, as required
U an	1	Transformer, submersible type, with single	U hw	1	Sign, warning
		bushing well (UG 11-1 & UG 11-1B)			Tape, as required
				2	Concrete blocks, 8" x 8" x 16"
Ugn	1	Enclosure with cover			
U hg	1	Anti-tomper shield			

SINGLE-PHASE
SUBMERSIBLE TRANSFORMER
WITH EXTERNAL SWITCHING PROVISION

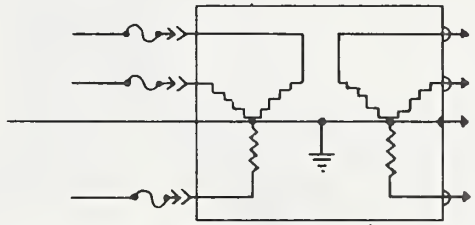
Dec. 1974		UG 11, UG 11B UG11-1 UG11-1B



ITEM	NO.	MATERIAL
p		Connectors, as required
av		Jumpers, as required
bu	1	Connector, equipment ground
U an	1	Transformer, pad-mounted, three phase,
		with one load break bushing per
		phase and internal fuses (UG17 & UG17B)
U an	1	Transformer, pad-mounted, three phase,
		with one load break bushing per
		phase (UG17-1 & UG17-1B)
U hp	3	Elbow, load break (UG17 & UG17B)
U hp	3	Elbow, load break, fused (UG17-1 & UG17-1B)
U hw	1	Sign, warning
		Tape, as required
ai	1	Rod, ground, galvanized steel (for
		cathodic protection)
aj	1	Clamp, ground rod
cj		Ground wire, as required



WIRING DIAGRAM
UG17



WIRING DIAGRAM
UG17-1

NOTES:

1. Only the Wye-Wye connection should be used to avoid ferro-resonance.

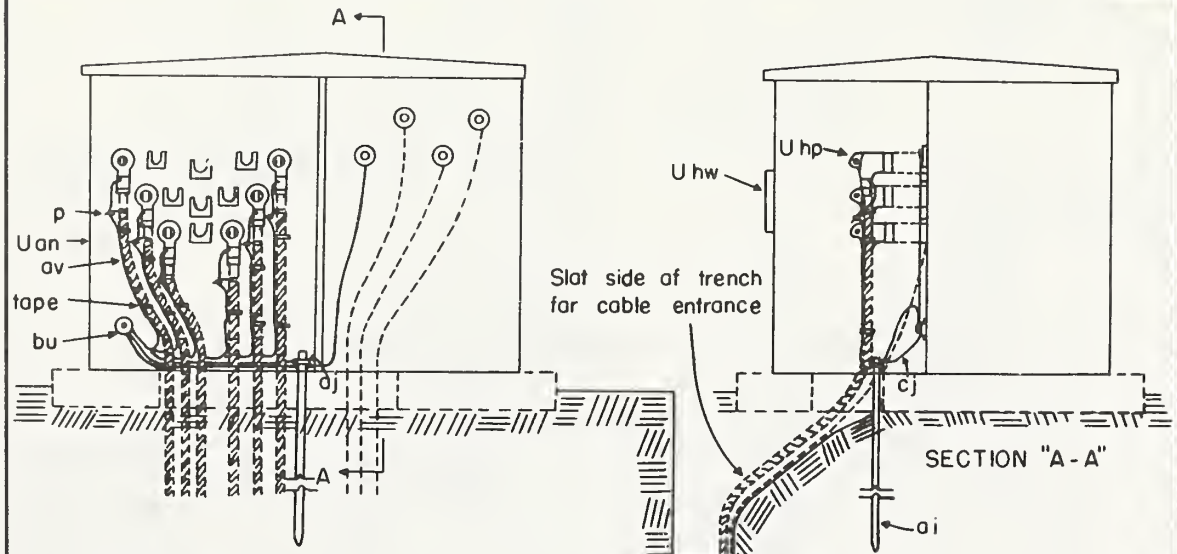
2. Provide sufficient primary neutral pigtail and cable slack to permit ready disconnection of elbow and mounting on parking stand. Train cables as shown.

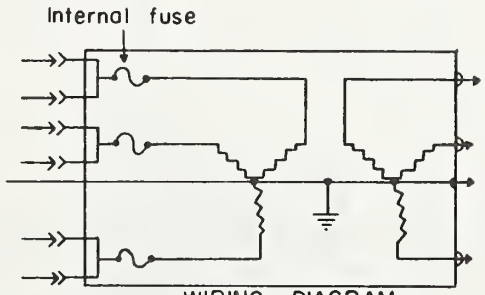
Designate as:

Transformer without secondary breakers	Transformer with secondary breakers	
UG17	UG17B	Unit with internal fuse
UG17-1	UG17-1B	Unit with fused load break elbows

THREE-PHASE, PAD-MOUNTED TRANSFORMER (RADIAL FEED)

Dec. 1974		UG17, UG17B UG17-1, UG17-1B





WIRING DIAGRAM
UG 17-2

ITEM	NO.	MATERIAL
p		Connectors, as required
av		Jumpers, as required
bu	1	Connector, equipment ground
Uan	1	Transformer, pad-mounted, three phase,
		with two load break bushings per phase
		and internal fuses (UG 17-2 & UG 17-2B)
Uhp	6	Elbow, load break (UG 17-2 & UG 17-2B)
Uhw	1	Sign, warning
		Tape, as required
ai	1	Rod, ground, galvanized steel (for
		cathodic protection)
aj	1	Clamp, ground rod
cj		Ground wire, as required

NOTES:
1. Only the Wye-Wye connection should be used to avoid ferro-resonance.
2. Provide sufficient primary neutral pigtail and cable slack to permit ready disconnection of elbow and mounting on parking stand. Train cables as shown.

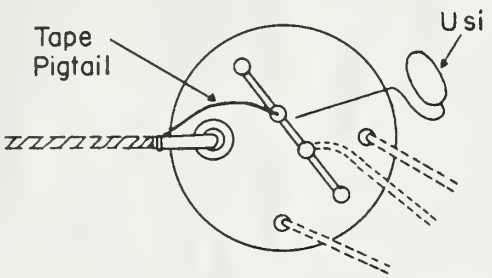
Designate as:

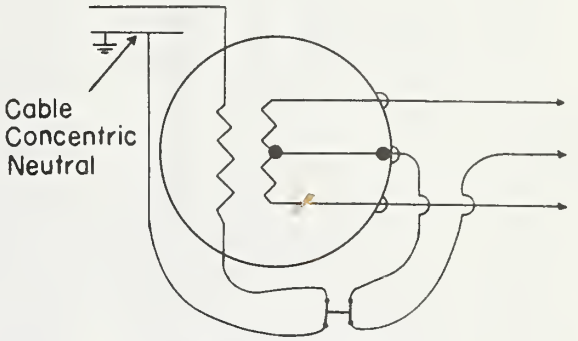
Transformer without secondary breakers	Transformer with secondary breakers	
UG 17-2	UG 17-2B	Unit with internal fuse

THREE-PHASE PAD-MOUNTED TRANSFORMER (LOOP FEED)

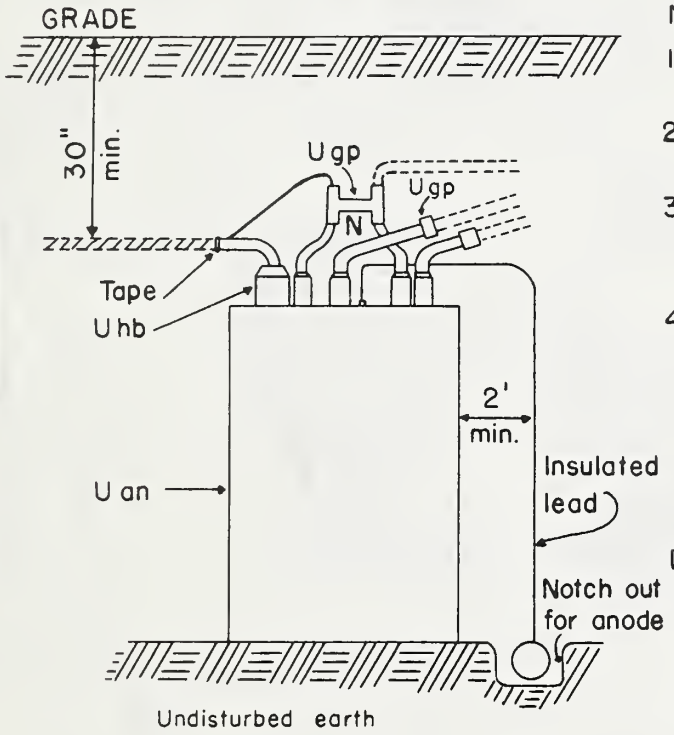
Dec. 1974

UG 17-2, UG 17-2B





WIRING DIAGRAM



NOTES:

1. All neutrals to be isolated from metallic tank.
2. Insulate all neutrals and connections.
3. Allow minimum slack of one foot in primary and secondary cables.
4. Non-load break elbow (Uhp) and bushing may be used in place of primary lead connector (U hb).

Designate as:

UG20	Transformer with metallic tank
UG 20-1	Transformer with nonmetallic tank

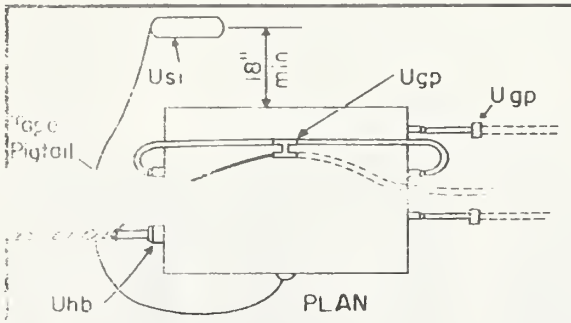
ITEM	NO.	MATERIAL	ITEM	NO.	MATERIAL
Uan	1	Transformer, direct burial, with single	Usi	1	Magnesium anode package, 9 lb.
		bushing well			(UG 20)
Ugp	3	Secondary insulated connector			
Uhb	1	Cable lead connector, primary			Tape, insulating, as required

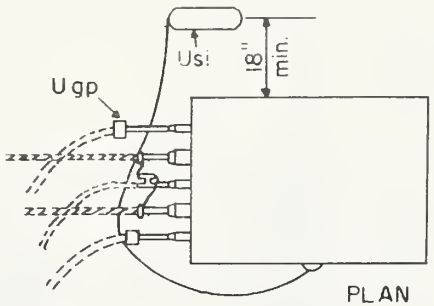
SINGLE-PHASE

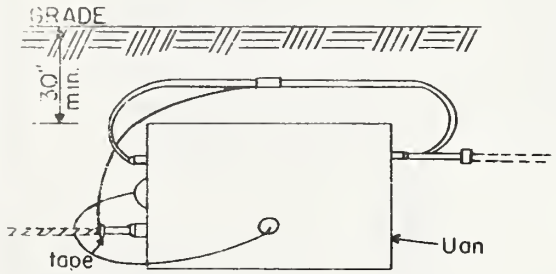
DIRECT BURIED TRANSFORMER

Dec. 1974

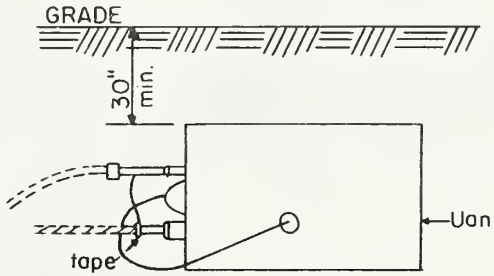
UG 20, UG20-1



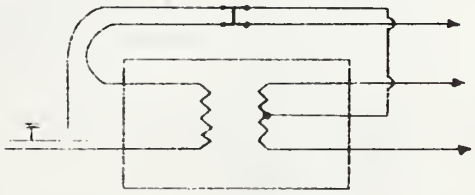




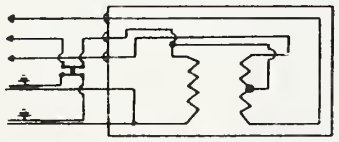
UG 21



UG 22



WIRING DIAGRAM
UG 21



WIRING DIAGRAM
UG 22

ITEM	NO.	MATERIAL
p		Connectors, as required
U an	1	Transformer, direct burial with single
		bushing well (UG 21 & UG 21-1)
U an	1	Transformer, direct burial with two
		bushing wells (UG 22 & UG 22-1)
U gp	3	Secondary insulated connectors
		(UG 21 & UG 21-1)
U hb	1	Cable lead connector, primary
		(UG 21 & UG 21-1)
U hb	2	Cable lead connector, primary
		(UG 22 & UG 22-1)
U gp	2	Secondary insulated connectors
		(UG 22 & UG 22-1)
U si	1	Magnesium anode package, 9lb. (UG 21,
		UG 21-1, UG 22 & UG 22-1)
		Tape, insulating, as required

NOTES:

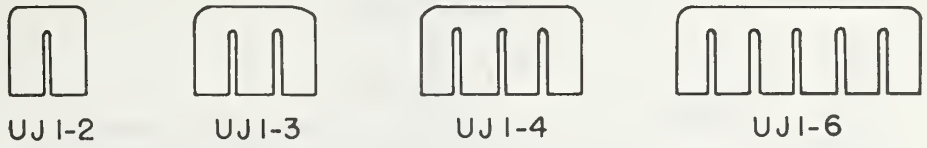
1. All neutrals to be isolated from metallic tank.
2. Insulate all neutrals and connections.
3. Allow minimum slack of one foot in primary and secondary cables.

Designate as:

Transformer with metallic tank	Transformer with nonmetallic tank	
UG 21	UG 21-1	Single termination type
UG 22	UG22-1	Two termination type

SINGLE - PHASE
TRENCH-LAY
DIRECT BURIED TRANSFORMER

Dec. 1974		UG21, UG21-1 UG22, UG22-1



CONNECTOR BLOCKS

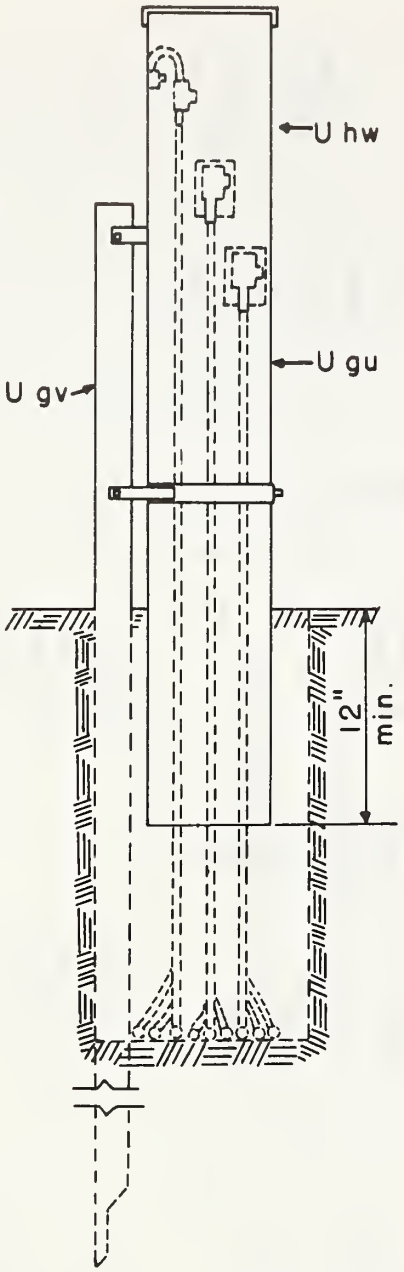
TRANSFORMER CONNECTOR BLOCKS

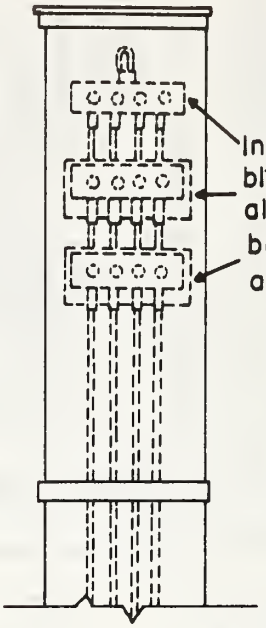
ITEM	NO.	MATERIAL	ITEM	NO.	MATERIAL
U fz		Transformer connector blocks, as required	U gp		Connector blocks, as required

SECONDARY CONNECTOR BLOCKS

Dec. 1974

UJ 1-, UJ 2-





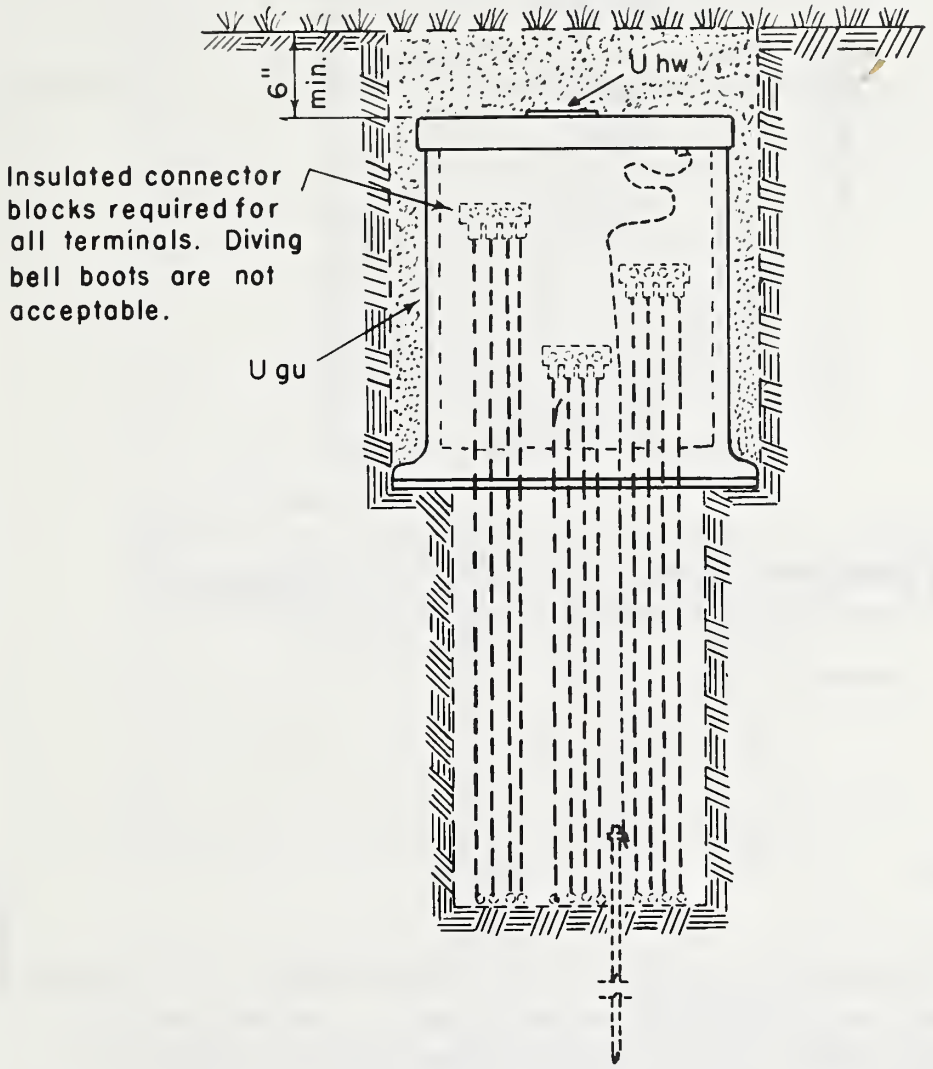
Insulated connector blocks required for all terminals. Diving bell boots are not acceptable.

ITEM	NO.	MATERIAL	ITEM	NO.	MATERIAL
U gu	1	Power pedestal	U hw	1	Sign, warning
U gv	1	Stake			

SECONDARY ASSEMBLY, UNDERGROUND CABLE

Dec. 1974

UK 5

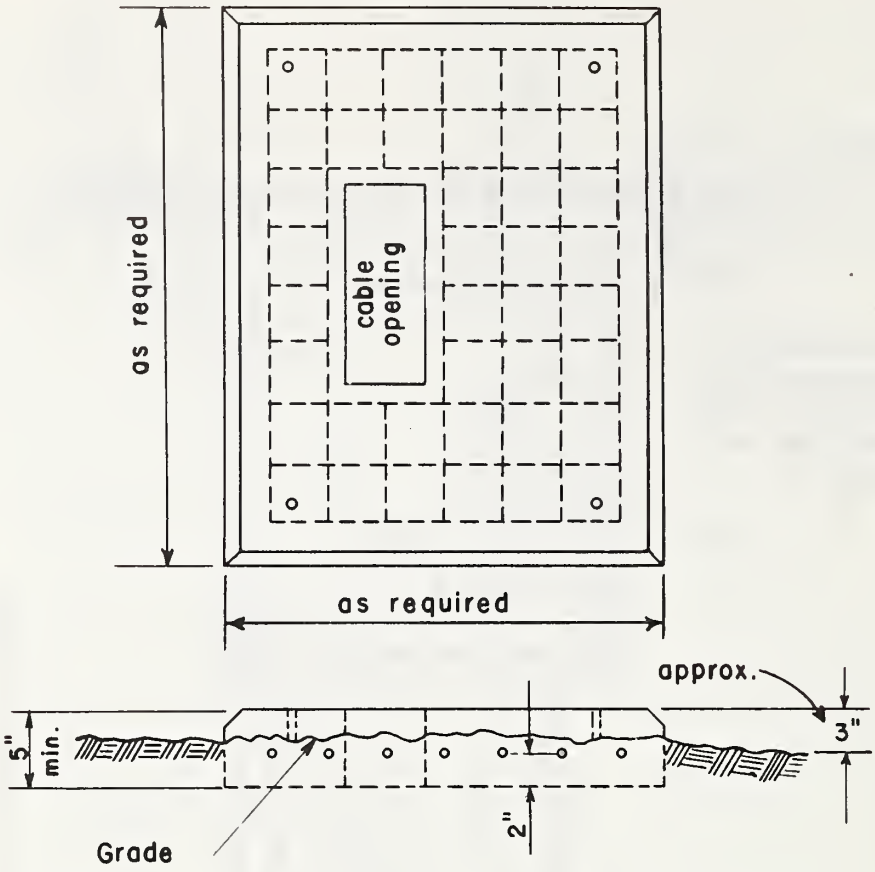


ITEM	NO.	MATERIAL	ITEM	NO.	MATERIAL
U gu	1	Power pedestal, buried type			
U hw	1	Sign, warning			

SECONDARY ASSEMBLY, UNDERGROUND CABLE

Dec. 1974

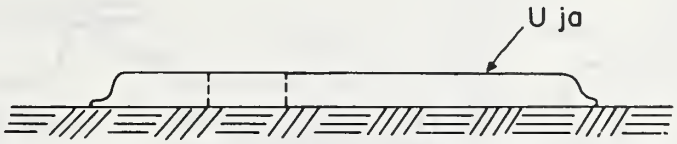
UK 6



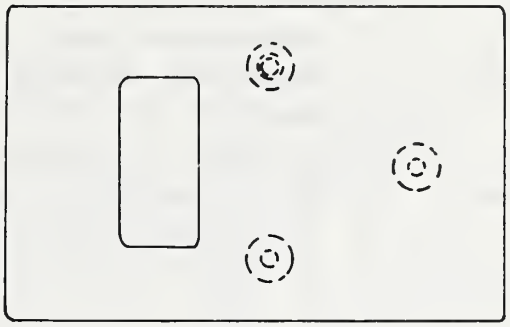
NOTES:

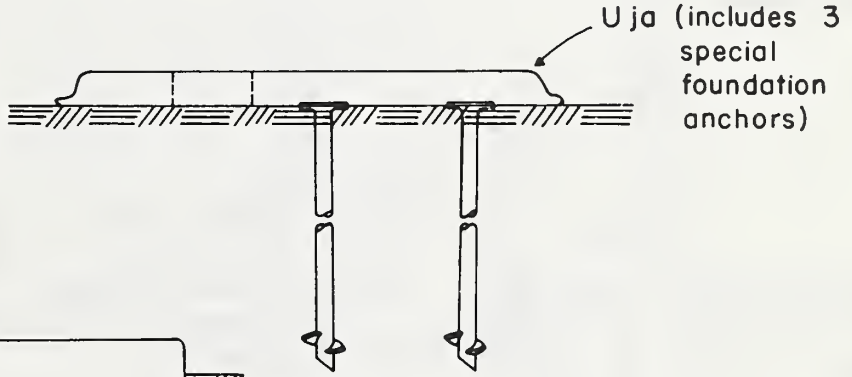
1. Pad assemblies include site preparation, bedding and drainage.
2. Slabs may be precast or poured in place. Concrete shall be a 1:2:4 mixture with a minimum design strength of 3000 P.S.I. Steel reinforcing shall be 6"x 6"- No.10 wire mesh to stop 1" from sides and cable opening.
3. Equipment shall be secured to pad in accordance with manufacturers instructions.
4. Location and size of cable opening shall be as required for cable run.
5. When owner furnishes transformers, sectionalizing equipment or other pad-mounted equipment, dimensioned drawings of pads will be furnished.

CONCRETE PAD ASSEMBLY		
Dec. 1974		UM 1

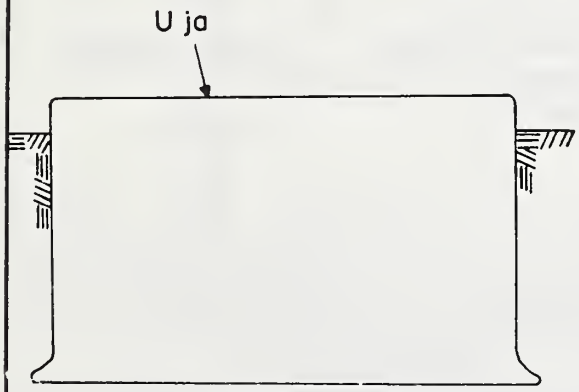


UM 1-2





UM 1-3



UM 1-4

Designate as:

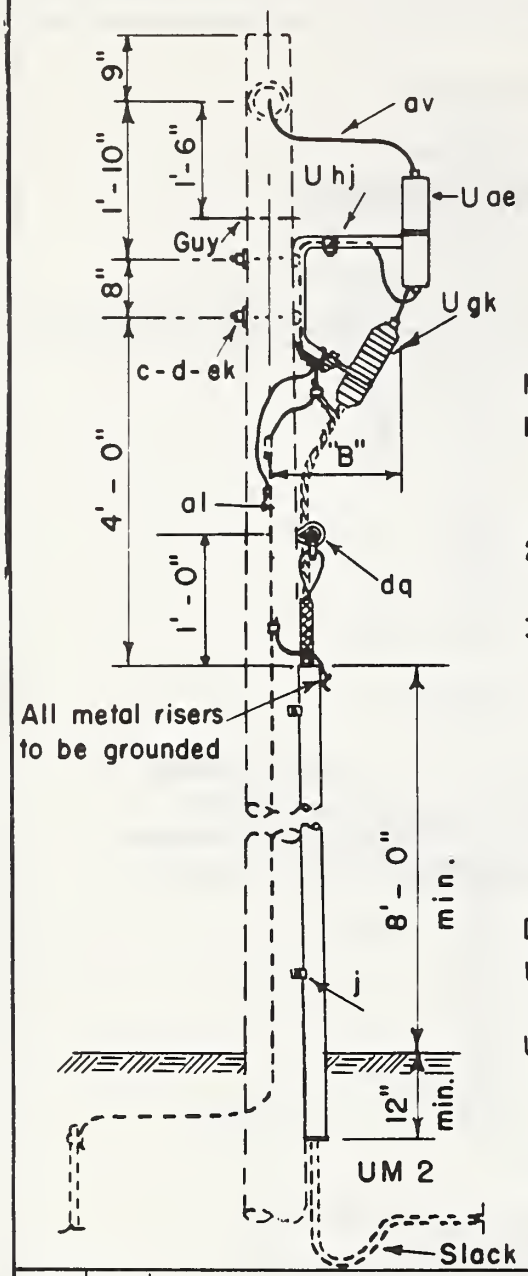
UM 1-2	Plastic pad
UM 1-3	Plastic pad with anchor mounting
UM 1-4	Plastic box pad

ITEM	NO.	MATERIAL	ITEM	NO.	MATERIAL
U ja	1	Plastic pad (UM 1-2)	U ja	1	Plastic pad and anchors (UM 1-3)
U ja	1	Plastic box pad (UM 1-4)			

PLASTIC PAD ASSEMBLIES

Dec. 1974

UM 1-2, UM 1-3, UM 1-4



"B" minimum	
7.2/12.5 kV	15"
14.4/24.9 kV	20"

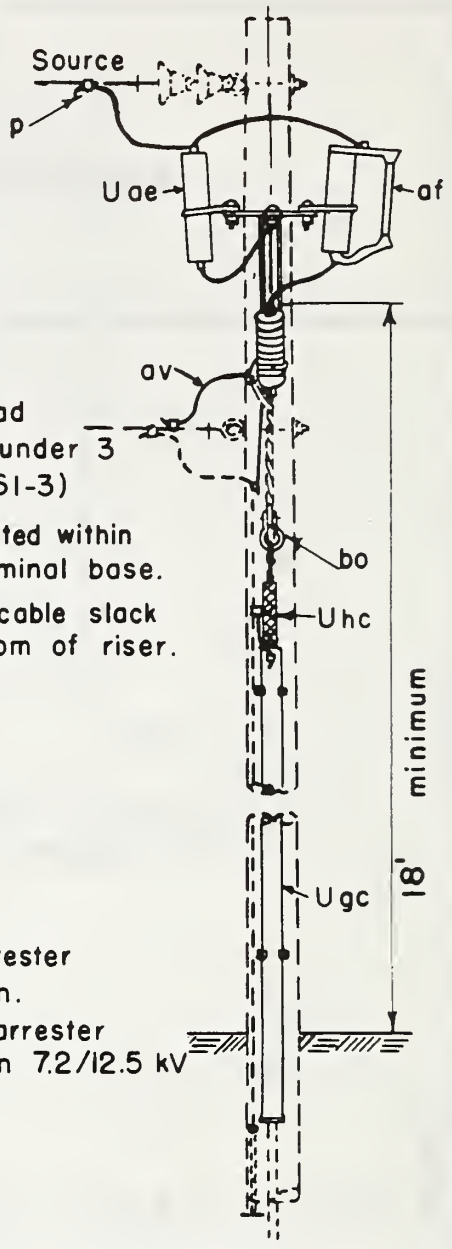
NOTES:

1. Total arrester lead length must be under 3 feet. (See Bull. 61-3)
2. No bends permitted within 6" of cable terminal base.
3. Allow minimum cable slack of 24" at bottom of riser.

Designate as:

UM 2 Single arrester installation.

UM2-A Parallel arrester installation 7.2/12.5 kV only.



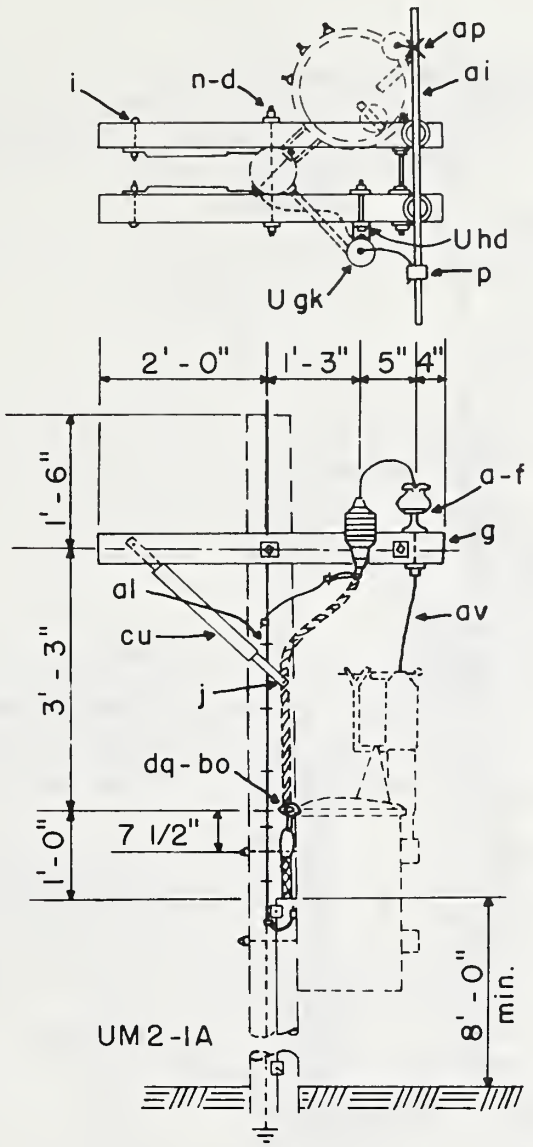
ITEM	NO.	MATERIAL	ITEM	NO.	MATERIAL
c	2	Bolt, machine, 5/8" x required length	bo	1	Shackle, anchor
d	2	Washer, square, 2 1/4"	ek		Locknuts, as required
j		Screw, lag, 1/2" x 4", as required	Uhj	1	Bracket, cutout, arrester & pothead ext.
dq	1	Eye screw, elliptical	Ugc	1	Cable riser shield, length as required
p		Connectors, as required	Ugk	1	Cable termination
Uae	1	Lightning arrester, dist. class, (UM2)	Uae	2	Lightning arrester, dist. class, (UM2A)
af	1	Cutout, load break type	Uhc	1	Cable support
av		Jumpers, as required	al		Staples, as required

SINGLE-PHASE CABLE TERMINAL POLE WITH DISTRIBUTION VALVE ARRESTER OVERHEAD SOURCE

REV. OCT. 1981

Dec. 1974

UM2, UM2A

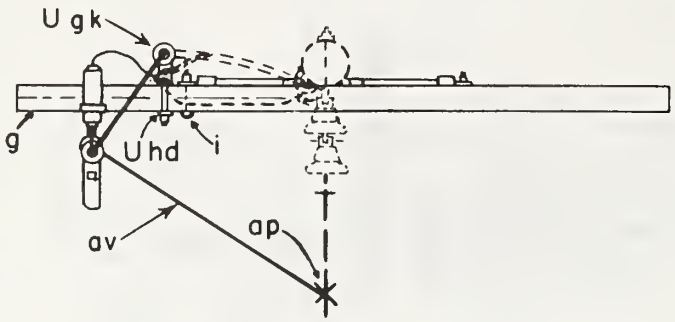


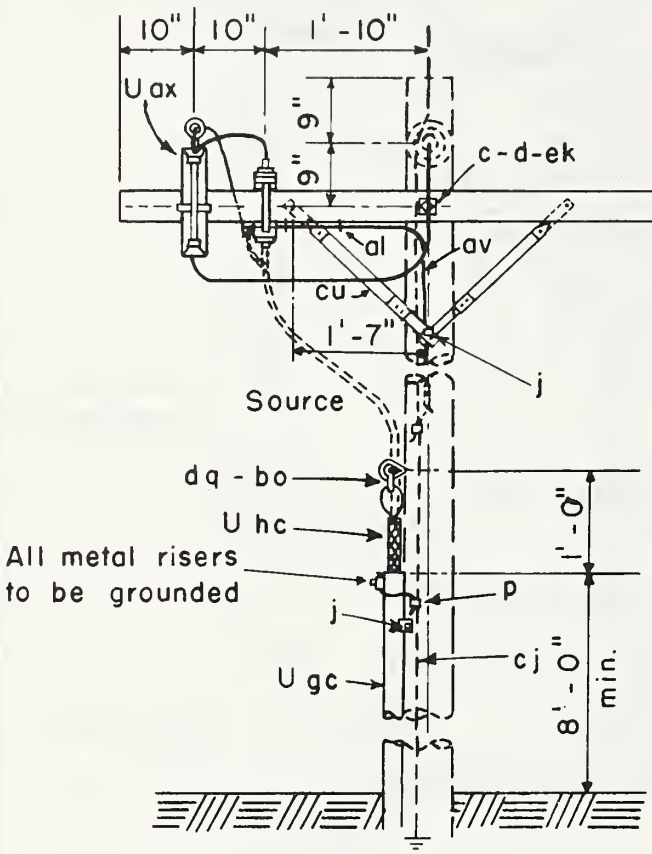
ITEM	NO	MATERIAL	ITEM	NO	MATERIAL
a	2	Insulator, pin type	bo	1	Shackle, anchor
d	6	Washer, square, 2 1/4"	cu	2	Brace, wood, 28"
f	2	Pin, crossarm, steel	dq	1	Eye screw, elliptical
g	2	Crossarm 3 5/8" x 4 5/8" x 4'-0"	dp	1	Clamp, ground wire
i	2	Bolt, carriage, 3/8" x 4 1/2"	ek		Locknuts, as required
j		Screw, lag, 1/2" x 4" as required	Ugc	1	Cable riser shield, length as required
n	2	Bolt, double arming, 5/8" x req d. lgth.	Ugk	1	Cable termination
p		Connectors, as required	Uhc	1	Cable support
ap	1	Clamp, hot line	ai	1/2	Ground rod, copper clad
av		Jumpers, as required	Uhd	1	Crossarm mounting bracket
al		Staples, as required			

SINGLE - PHASE CABLE TERMINATION ON EXISTING TRANSFORMER POLE

Dec. 1974

UM 2 - 1A





NOTE:

Total arrester lead length must be under 3 feet. (See Bulletin 61-3)

Designate as:

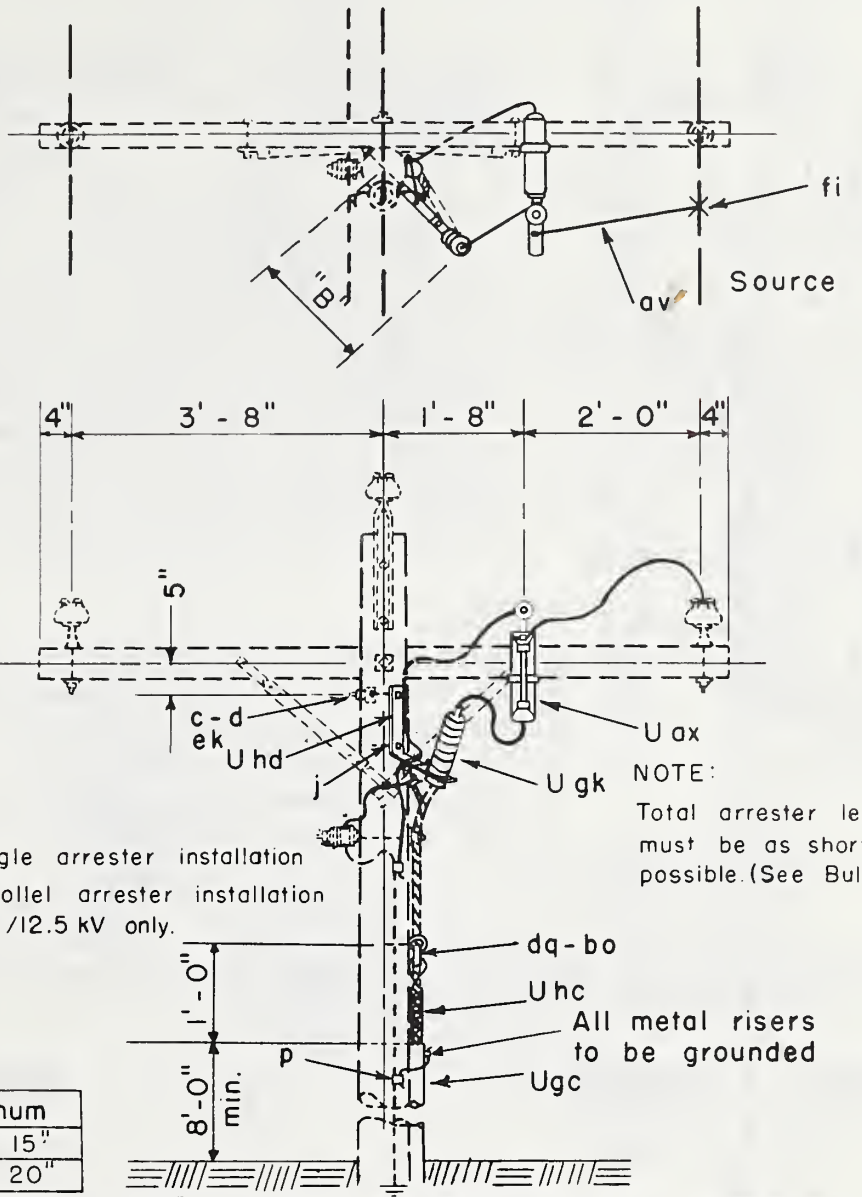
UM 2-2 Single arrester installation

UM 2-2A Parallel arrester installation 7.2/12.5 kV only.

ITEM	NO.	MATERIAL	ITEM	NO.	MATERIAL
c	1	Bolt, machine, 5/8" x required length	ap	1	Clamp, hot line, tap assembly
d	2	Washer, square, 2 1/4"	av		Jumpers, as required
g	1	Crossarm, 3 5/8" x 4 5/8" x 8'-0"	ba	1	Shackle, anchor
i	2	Bolt, carriage, 3/8" x 4 1/2"	al		Staples, as required
j		Screw, lag, 1/2" x 4", as required	cu	2	Brace, wood, 28"
dq	1	Eye screw, elliptical	ek		Locknuts, as required
p		Connectors, as required	Ugc	1	Cable riser shield, length as required
Uhc	1	Cable support	Ugk	1	Cable termination
Uax	1	Cutout, load break type and single	Uax	1	Cutout, load break type and parallel
		arrester combination (UM 2-2)			arrester combination (UM 2-2A)
Uhd	1	Crossarm mounting bracket			

SINGLE - PHASE TERMINAL POLE UNDERGROUND SOURCE

Dec. 1974		UM 2-2, UM 2-2A



Designate as:

UM 2-3 Single arrester installation

UM 2-3A Parallel arrester installation 7.2/12.5 kV only.

NOTE:

Total arrester lead length must be as short as possible. (See Bulletin 61-3)

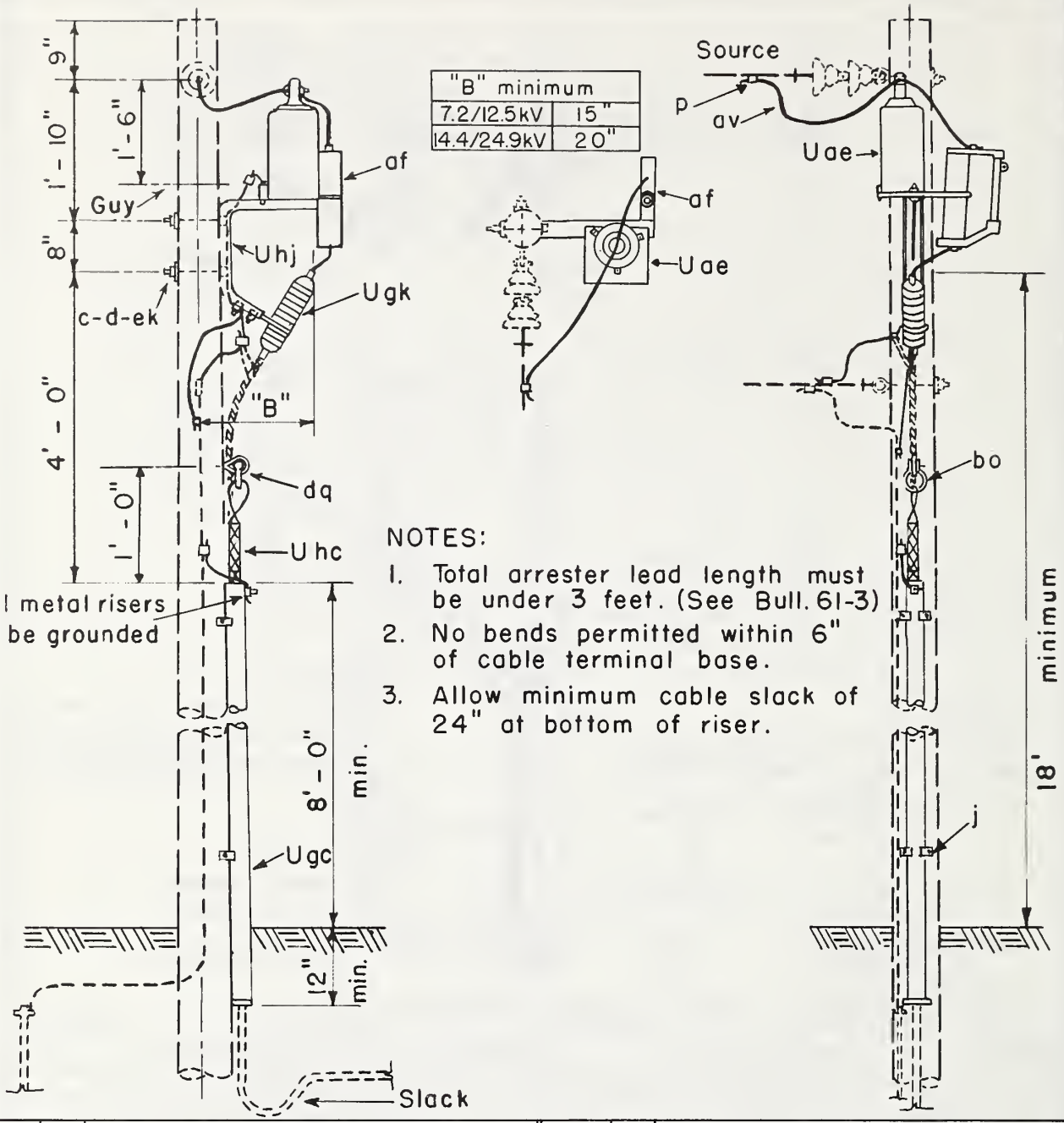
"B" minimum	
7.2/12.5 kV	15"
14.4/24.9 kV	20"

ITEM	NO.	MATERIAL	ITEM	NO.	MATERIAL
c	1	Bolt, machine, 5/8" x required length	bo	1	Shackle, anchor
d	1	Washer, square, 2 1/4"	e k		Locknuts, as required
j		Screw, lag, 1/2" x 4", as required	f i	1	Connector, hot line tap assembly
dq	1	Eye screw, elliptical	Ugc	1	Cable riser shield, length as required
p		Connectors, as required	Ugk	1	Cable termination
a v		Jumpers, as required	Uhc	1	Cable support
Uax	1	Cutout, load break type and single	Uhd	1	Bracket, pothead mounting
		arrester combination (UM 2-3)	Uax	1	Cutout, load break type and parallel
					arrester combination (UM 2-3A)

THREE-PHASE OVERHEAD SOURCE SINGLE-PHASE UNDERGROUND WITH COMBINATION CUTOUT AND ARRESTER

Dec. 1974

UM2-3, UM2-3A



NOTES:

1. Total arrester lead length must be under 3 feet. (See Bull. 61-3)
2. No bends permitted within 6" of cable terminal base.
3. Allow minimum cable slack of 24" at bottom of riser.

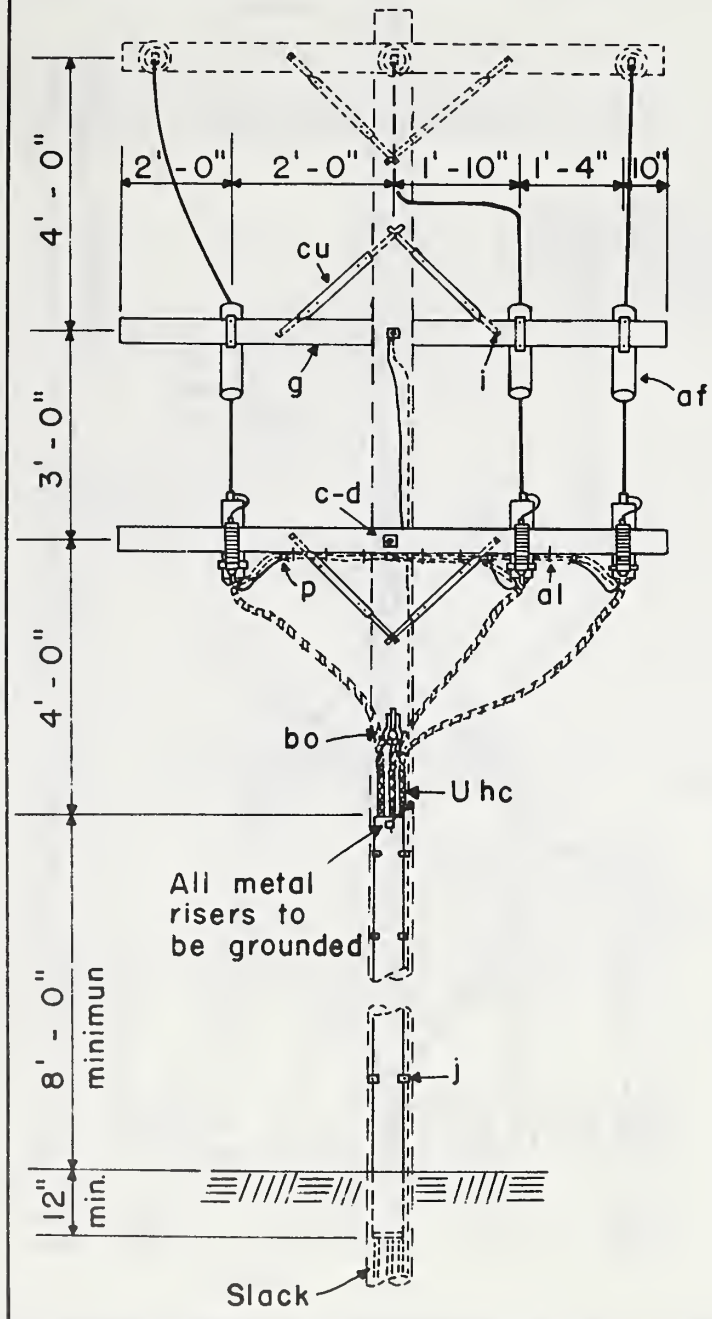
ITEM	NO.	MATERIAL	ITEM	NO.	MATERIAL
c	2	Bolt, machine, 5/8"x required length	bo	1	Shackle, anchor
d	2	Washer, square, 2 1/4"	ek		Locknuts, as required
j		Screw, lag, 1/2"x 4", as required	Ugc	1	Cable riser shield, length as required
dq	1	Eye screw, elliptical	Ugk	1	Cable termination
p		Connectors, as required	Uhc	1	Cable support
Uae	1	Lightning arrester, intermediate class	Uhj	1	Bracket, cutout, arrester and pothead
af	1	Cutout, load break type			extension
av		Jumpers, as required	al		Staples, as required

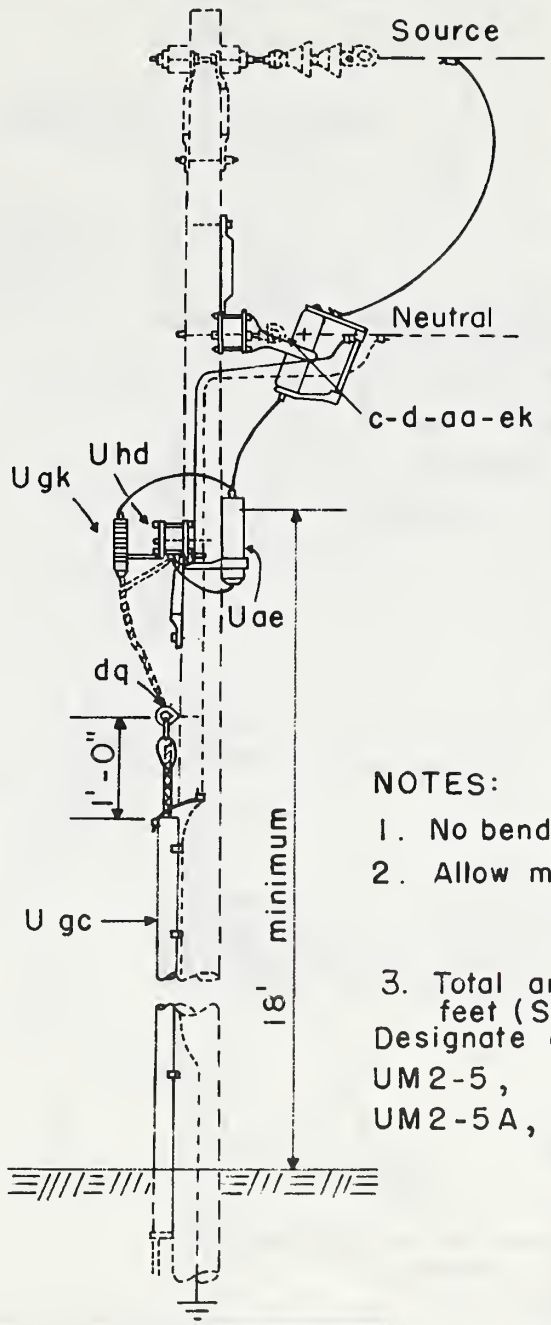
SINGLE-PHASE CABLE TERMINAL POLE WITH INTERMEDIATE ARRESTER OVERHEAD SOURCE

REV. OCT 1981

Dec. 1974

UM2-4





ITEM	NO.	MATERIAL
c	2	Bolt, machine, 5/8" x req'd. length
d	4	Washer, square, 2 1/4"
g	2	Crossarm, 3 5/8" x 4 5/8" x 8'-0"
i	4	Bolt, carriage, 3/8" x 4 1/2"
j		Screw, lag, 1/2" x 4", as required
p		Connectors, as required
aa	1	Nut, eye, 5/8"
af	3	Cutout, load break type
al		Staples, as required
av		Jumpers, as required
bo	1	Shackle, anchor
cu	4	Brace, wood, 28"
dq	1	Eye screw, elliptical
ek		Locknuts, as required
Uae	3	Lightning arrester, dist. class (UM2-5)
Uae	6	Lightning arrester, dist. class (UM2-5A)
Ugc	1	Cable riser shield, length as req'd.
Ugk	3	Cable termination
Uhd	3	Crossarm mounting bracket
Uhc	3	Cable support

NOTES:

1. No bends permitted within 6" of cable terminal base.
2. Allow minimum cable slack of 24" at bottom of riser.
3. Total arrester lead length must be under 3 feet (See Bull. 61-3).

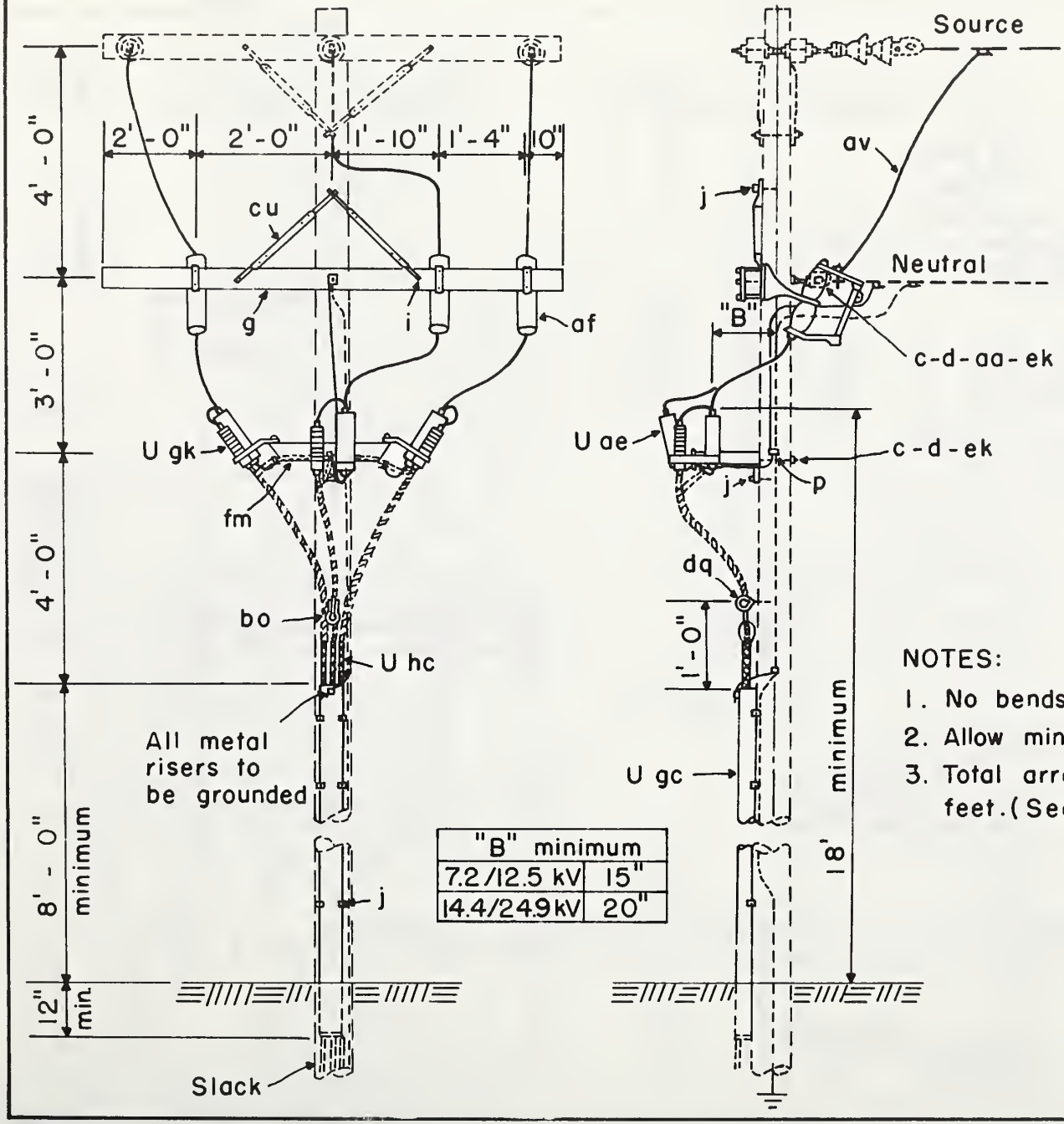
Designate as:

UM2-5, Single arrester installation.

UM2-5A, Parallel arrester installation 7.2/12.5 kV only.

THREE-PHASE CABLE TERMINAL POLE WITH DIST. VALVE ARRESTERS

REV. OCT. 1981		
Dec. 1974		UM2-5, UM2-5A



"B" minimum	
7.2/12.5 kV	15"
14.4/24.9 kV	20"

ITEM	NO.	MATERIAL
c	2	Bolt, machine, 5/8" x req'd. length
d	1	Washer, square, 2 1/4"
g	1	Crossarm, 3 5/8" x 4 5/8" x 8'-0"
i	2	Bolt, carriage, 3/8" x 4 1/2"
j		Screw, lag, 1/2" x 4", as required
p		Connectors, as required
aa	1	Nut, eye, 5/8"
af	3	Cutout, load break type
fm	1	Mounting bracket
av		Jumpers, as required
bc	1	Shackle, anchor
cu	2	Brace, wood, 28"
dq	1	Eye screw, elliptical
ek		Locknuts, as required
Uae	3	Lightning arrester, distribution class
U gc	1	Cable riser shield, length as req'd.
U gk	3	Cable termination
U hc	3	Cable support

NOTES:

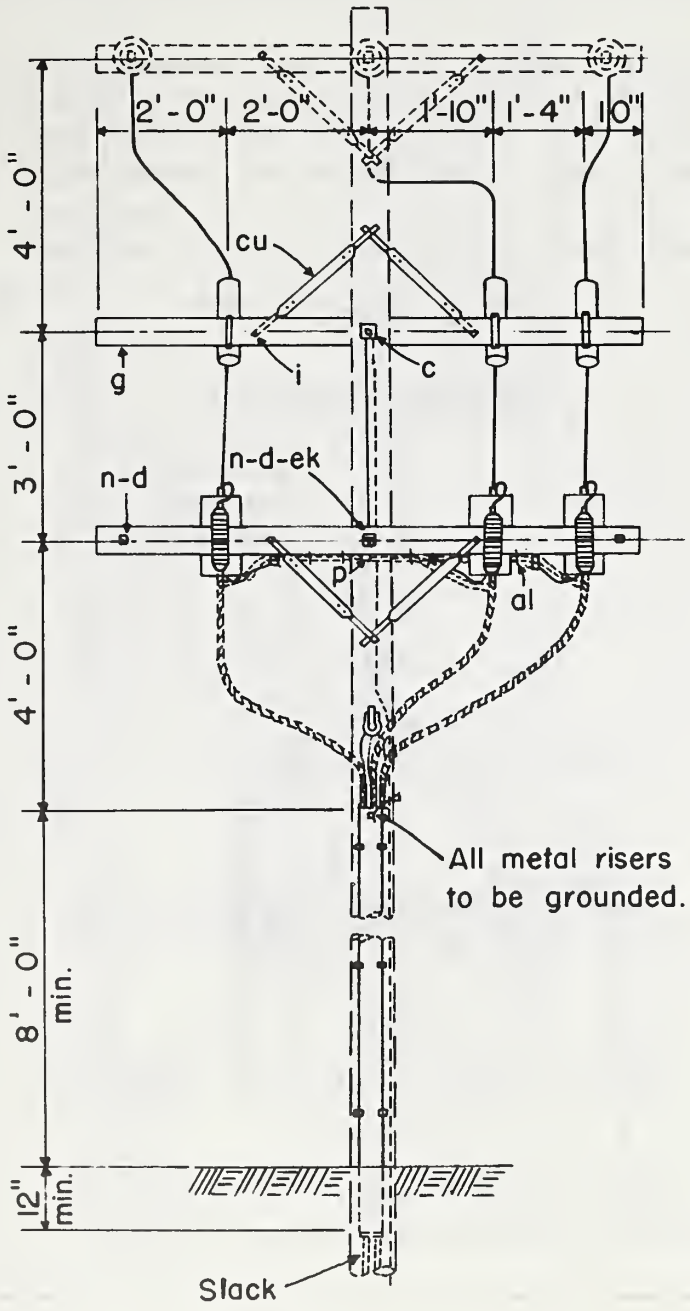
1. No bends permitted within 6" of cable terminal base.
2. Allow minimum cable slack of 24" at bottom of riser.
3. Total arrester lead length must be under 3 feet. (See Bull. 61-3).

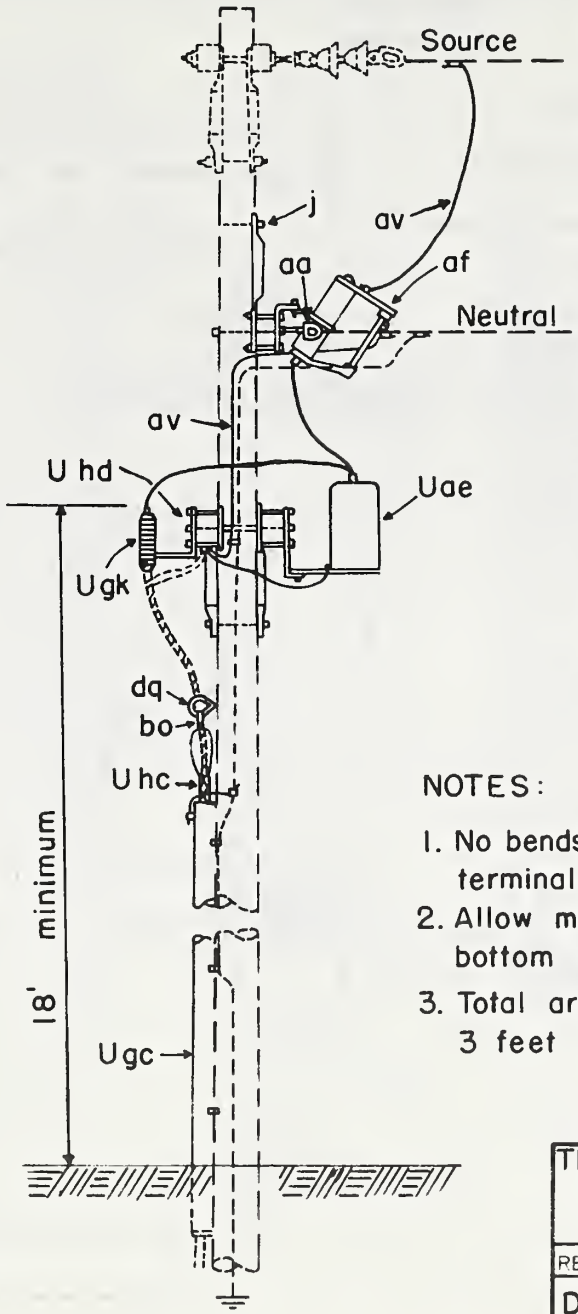
THREE-PHASE CABLE TERMINAL POLE WITH DIST. VALVE ARRESTERS OVERHEAD SOURCE

REV. OCT. 1981

Dec. 1974

UM2-5-1





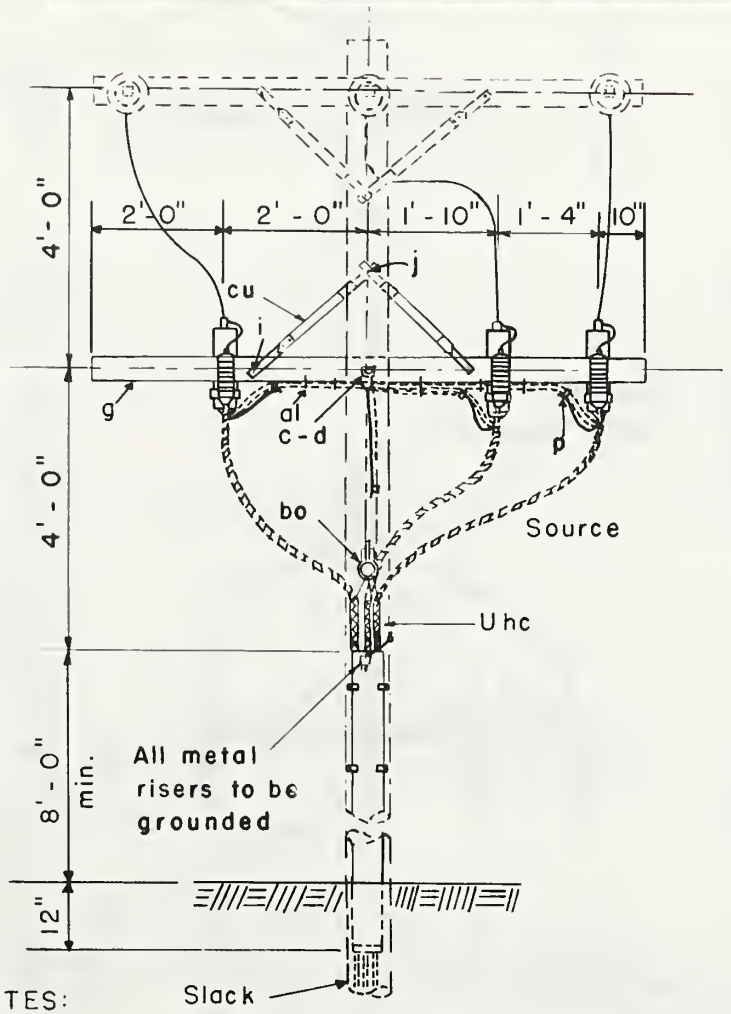
ITEM	NO.	MATERIAL
c	1	Bolt, machine, 5/8" x req'd. length
d	14	Washer, square, 2 1/4"
g	3	Crossarm, 3 5/8" x 4 5/8" x 8'-0"
i	6	Bolt, carriage, 3/8" x 4 1/2"
j		Screw, lag, 1/2" x 4", as required
n	3	Bolt, double arming, 5/8" x req'd. lgth.
p		Connectors, as required
aa	1	Nut, eye, 5/8"
Uae	3	Lightning arrester, intermediate class
af	3	Cutout, load break type
av		Jumpers, as required
al		Staples, as required
bo	1	Shackle, anchor
cu	6	Brace, wood, 28"
U gc	1	Cable riser shield, length as req'd.
U gk	3	Cable termination
Uhd	3	Crossarm mounting bracket
U hc	3	Cable support
dq	1	Eye screw, elliptical

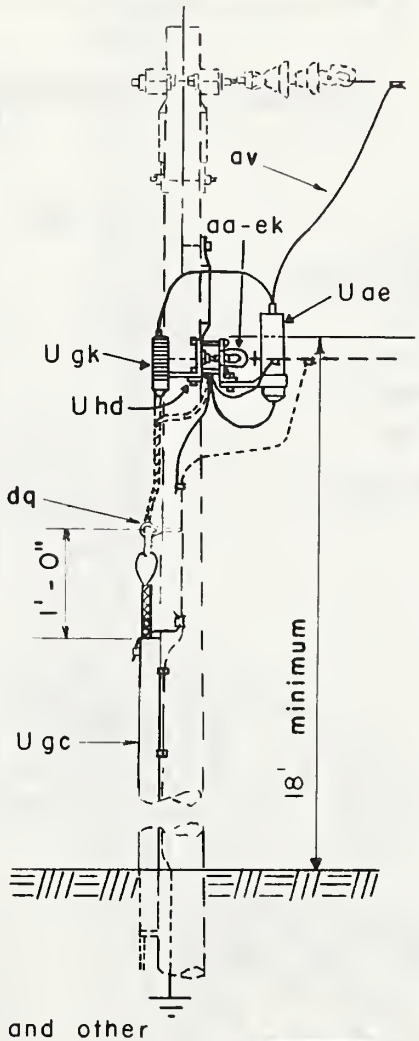
NOTES:

1. No bends permitted within 6" of cable terminal base.
2. Allow minimum cable slack of 24" at bottom of riser.
3. Total arrester lead length must be under 3 feet (See Bull. 61-3).

THREE-PHASE CABLE TERMINAL POLE WITH INTERMEDIATE ARRESTERS OVERHEAD SOURCE

REV OCT. 1981		
Dec. 1974		UM2-6





ITEM	NO.	MATERIAL
d	2	Washer, square, 2 1/4"
g	1	Crossarm, 3 5/8" x 4 5/8" x 8' - 0"
i	2	Bolt, carriage, 3/8" x 4 1/2"
j		Screw, lag, 1/2" x 4", as required
c	1	Bolt, machine, 5/8" x required length
p		Connectors, as required
aa	1	Nut, eye, 5/8"
Uae	3	Lightning arrester, distribution class
al		Staples, as required
av		Jumpers, as required
bo	1	Shackle, anchor
cu	2	Brace, wood, 28"
dq	1	Eye screw, elliptical
ek		Locknuts, as required
Ugc	1	Cable riser shield, length as required
Ugk	3	Cable termination
Uhd	3	Crossarm mounting bracket
Uhc	3	Cable support

NOTES:

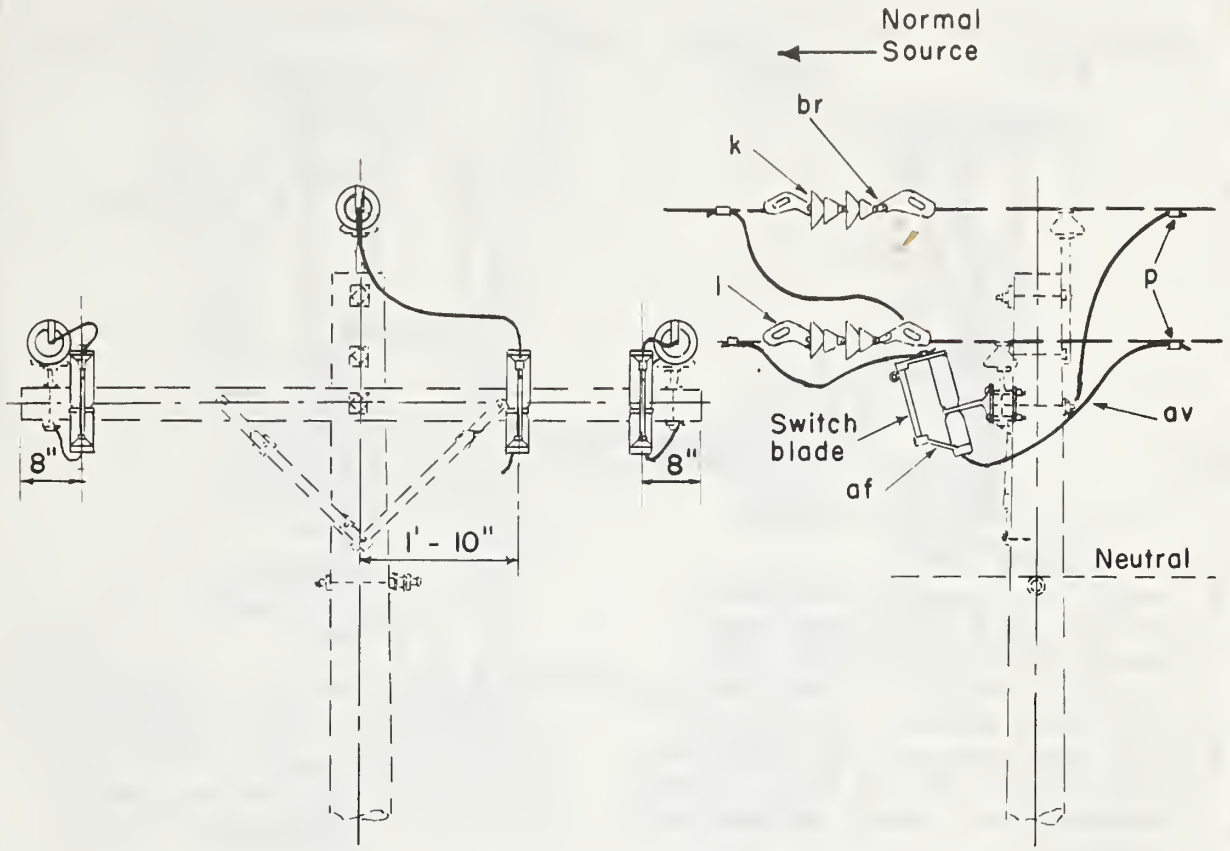
1. This unit may also be used for crossing highways and other obstacles.
2. Blade cutouts may be installed on adjacent span, see drawing UM3-3.
3. Total arrester lead length must be under 3 feet. (See Bull. 61-3)
4. No bends permitted within 6" of cable terminal base.
5. Allow minimum cable slack of 24" at bottom of riser.

THREE-PHASE CABLE TERMINAL POLE
UNDERGROUND SOURCE

REV. OCT. 1981

Dec. 1974

UM2 - 7



NOTE:

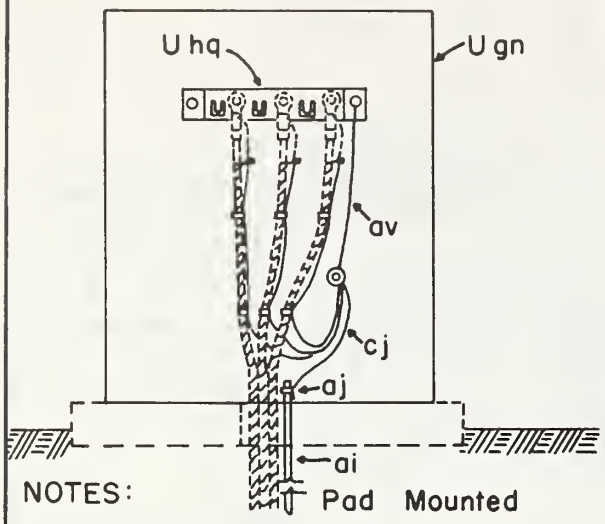
This drawing is intended for use with UM 2-7 for situations where the source is underground.

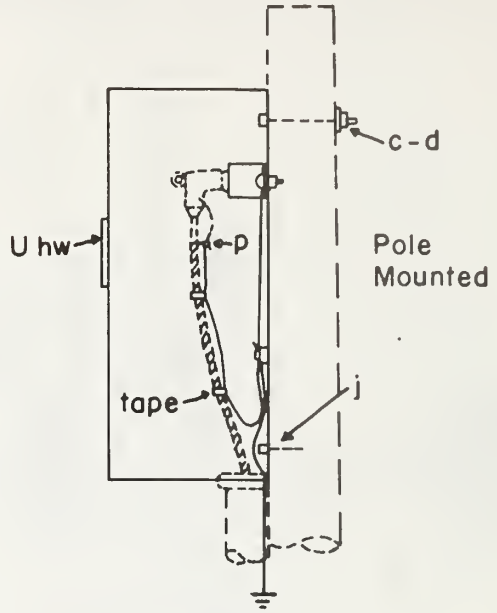
ITEM	NO.	MATERIAL	ITEM	NO.	MATERIAL
l	6	Clamp, deadend	k	6	Insulatar, suspensian
p		Cannectars, as required			
af	3	Cutaut, blade			
av		Jumpers, as required			
br	3	Chain link, 5/8" x 3 1/4"			

THREE-PHASE CROSSARM CONSTRUCTION
THREE SECTIONALIZING CUTOUTS

Dec. 1974

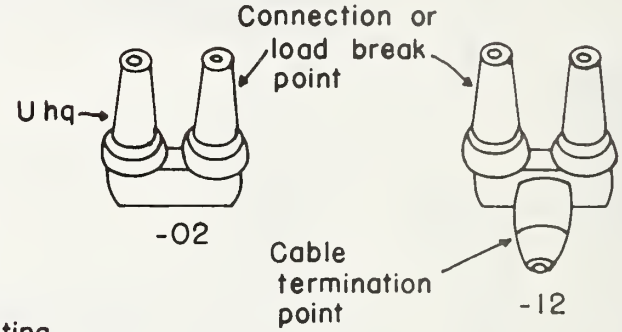
UM3-3





NOTES:

1. See drawing UM 40.
2. Install pole mounted enclosures a minimum of 4 feet above ground. Specify conduit or U-guards as needed to extend at least one foot below grade.
3. Load break elbows and fused load break elbows are not part of this assembly. They should be specified separately.
4. Owner to specify whether pad mounting or pole mounting is required.



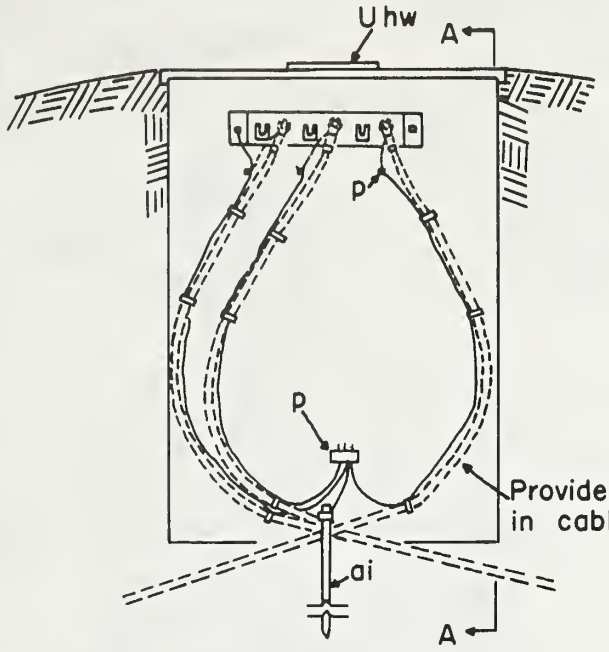
ITEM	NO.	MATERIAL
c	1	Bolt, mochine, 5/8" x required length
		(pole mounted)
d	1	Washer, square, 2 1/4" (pole mounted)
j	1	Screw, log, 1/2" x 4" (pole mounted)
p		Connectors, as required
ai	1	Rod, ground, galvanized steel (for
		cathodic protection)
aj	1	Clamp, ground rod
av		Jumpers, as required
cj		Ground wire, as required
U gn	1	Enclosure
U hq	1	Cable termination, multipoint
U hw	1	Sign, warning
		Tape, as required

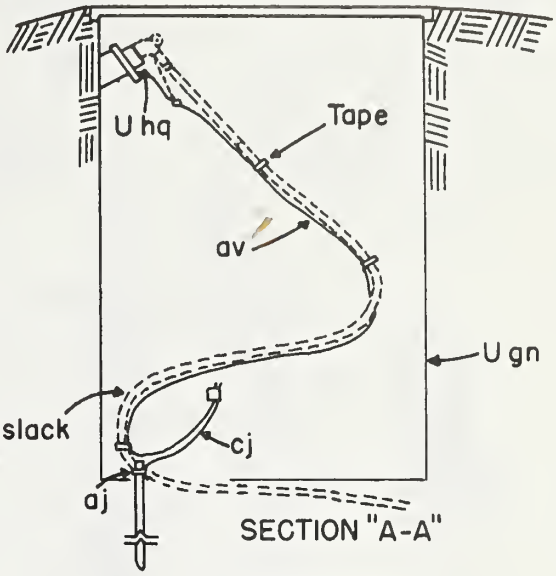
SECTIONALIZING UNITS		
Designate as: UNIT	No. of cable termination points	No. of load break points
UM3-02	0	2
UM3-03	0	3
UM3-04	0	4
UM3-06	0	6
UM3-08	0	8
UM3-11	1	1
UM3-12	1	2
UM3-21	2	1
UM3-22	2	2

SINGLE-PHASE SECTIONALIZING ASSEMBLY POLE OR PAD-MOUNTED

Dec. 1974

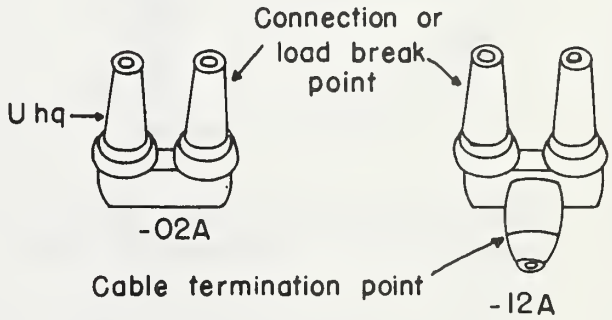
UM 3-02 To UM3-22





NOTES:

1. See drawing UM 40.
2. Load break elbows and fused load break elbows are not part of this assembly. They should be specified separately.



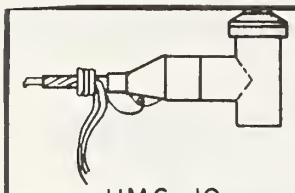
ITEM	NO.	MATERIAL
p		Connectors, as required
ai	1	Rod, ground, galvanized steel (for cathodic protection)
aj	1	Clamp, ground rod
av		Jumpers, No. 6 copper, as required
cj		Ground wire, as required
U gn	1	Enclosure with solid cover
U hq	1	Cable termination, multipoint
U hw	1	Sign, warning
		Tape, as required

SECTIONALIZING UNITS		
Designate as: UNIT	No. of cable termination points	No. of load break points
UM3-02A	0	2
UM3-03A	0	3
UM3-04A	0	4
UM3-06A	0	6
UM3-08A	0	8
UM3-11A	1	1
UM3-12A	1	2
UM3-21A	2	1
UM3-22A	2	2

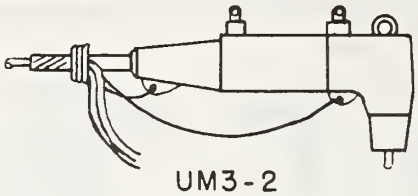
SINGLE - PHASE SECTIONALIZING ASSEMBLY - SUBMERSIBLE

Dec. 1974

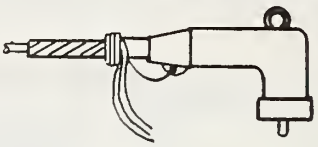
UM3-02A To UM3-22A



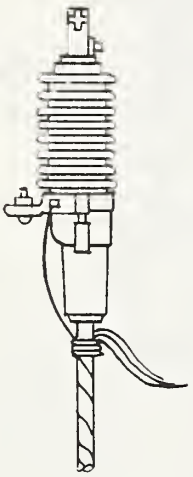
UM6-10
Non-Load Break
Termination (600A.)
(Uhb)



UM3-2
Fused Elbow
Termination
(Uhp)

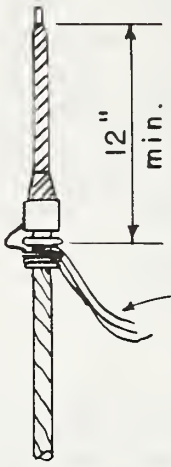


UM3-1
Load Break
Elbow Termination
(U hp)

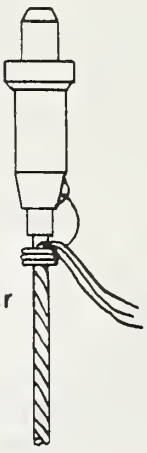


UM6-2
(Porcelain)
(U gk)

UM6-2A
(Synthetic Rubber)
(U gk)



UM6-5
Indoor Type
(See note #2)
(U gk)

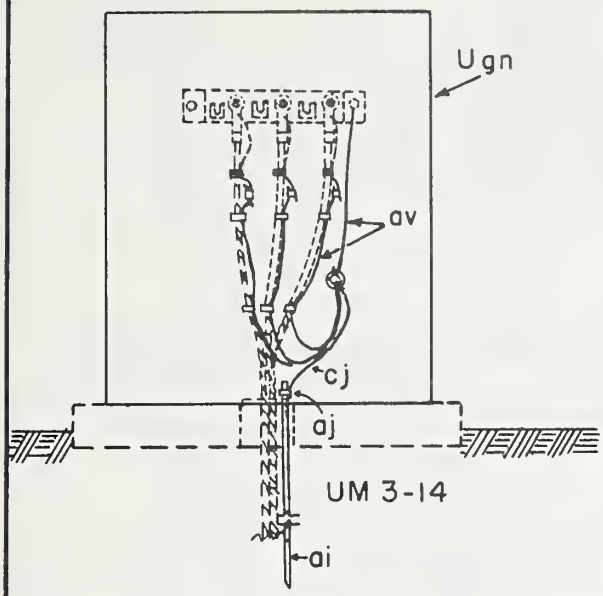


UM6-3
Cable Lead
Termination
(U hb)

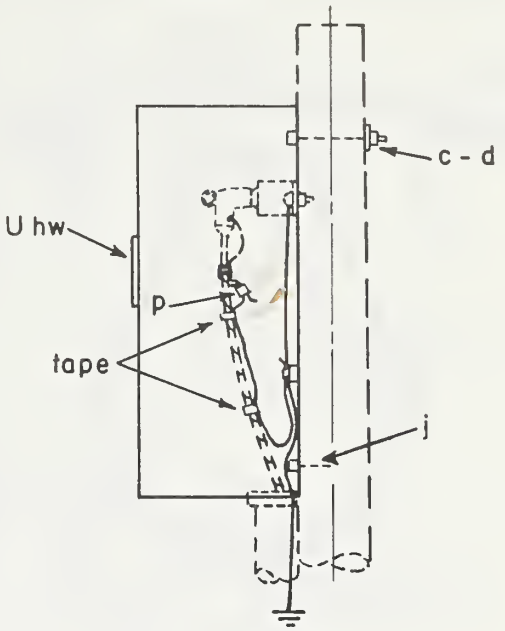
NOTES:

1. Use one strand of concentric neutral to ground termination
2. UM6-5: Start on insulating portion of prefabricated cone and apply two layers of weather and track resistant insulating vinyl or silicone cover tape. Do not use friction or conducting tape.
3. Install termination on cable in accordance with manufacturer's instructions.
4. Outdoor termination unit includes hardware for attachment to mounting brackets.

PRIMARY CABLE TERMINATIONS	
Dec. 1974	UM3-1, UM3-2, UM6-2, UM6-2A, UM6-3, UM6-5, UM6-10



UM 3-14



UM 3-15

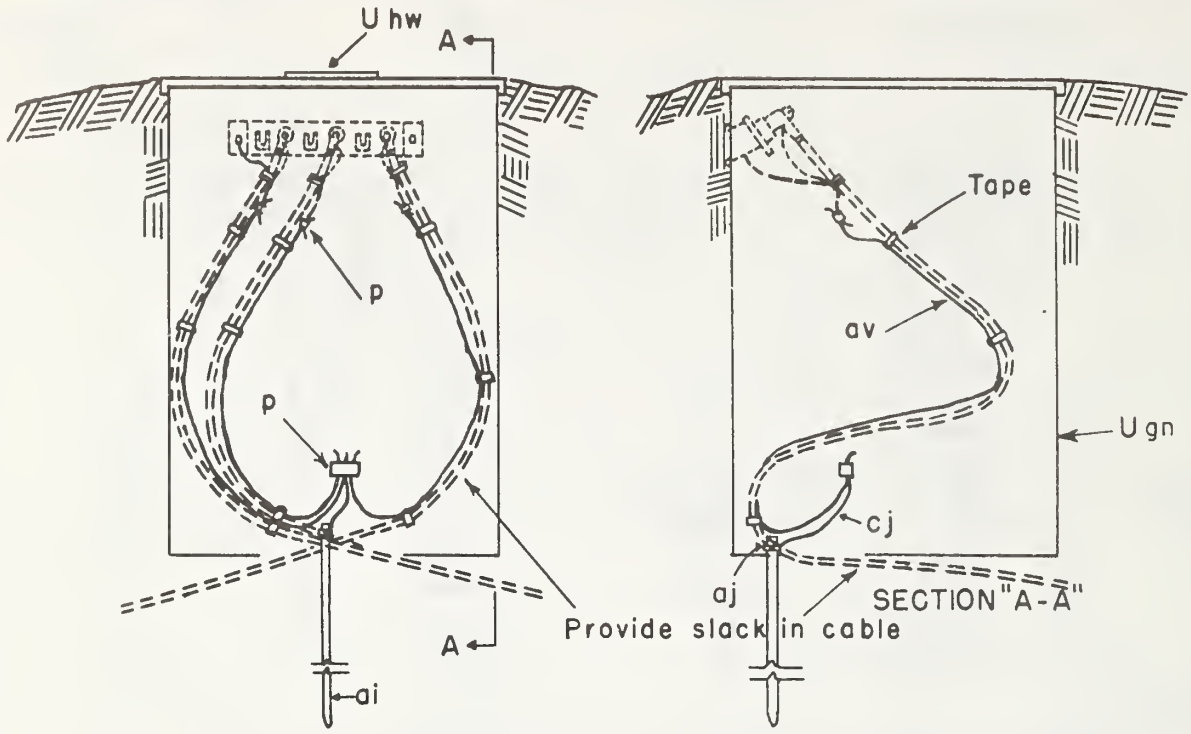
NOTES:

1. Multipoint termination assembly must be specified separately. See drawing UM 40.
2. Install pole mounted enclosures a minimum of 4 feet above ground. Specify conduit or U-guards as needed to extend at least one foot below grade.
3. Load break elbows and fused load break elbows are not part of this assembly. They should be specified separately.

ITEM	NO.	MATERIAL	ITEM	NO.	MATERIAL
		Tape, as required	ai	1	Rod, ground, galvanized steel (for
c	1	Bolt, mochine, 5/8" x required length			cathodic protection)
		(pole mounted)	cj		Ground wire, os required
d	1	Washer, square, 2 1/4" (pole mounted)			
j	1	Screw, lag, 1/2" x 4" (pole mounted)			
p		Connectors, as required			
av		Jumpers, as required			
aj	1	Clamp, ground rod			
Ugn	1	Enclosure			
U hw	1	Sign, warning			

SINGLE-PHASE SECTIONALIZING ASSEMBLY POLE OR PAD-MOUNTED

Dec. 1974		UM 3-14, UM 3-15



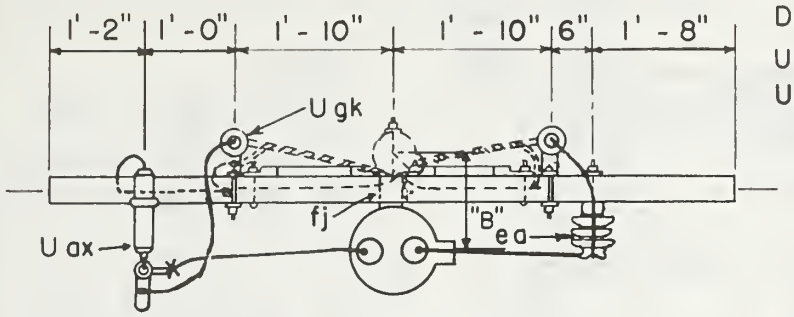
NOTES:

1. Multipoint termination assembly must be specified separately. See drawing UM 40.
2. Load break elbows and fused load break elbows are not part of this assembly. They should be specified separately.

ITEM	NO.	MATERIAL	ITEM	NO.	MATERIAL
p		Connectors, as required	ai	1	Rod, ground, galvanized steel (for
av		Jumpers, No.6 copper, as required			cathodic protection)
aj	1	Clamp, ground rod	cj		Ground wire, as required
Ugn	1	Enclosure with solid cover			
Uhw	1	Sign, warning			
		Tape, as required			

SINGLE-PHASE SECTIONALIZING ASSEMBLY – SUBMERSIBLE

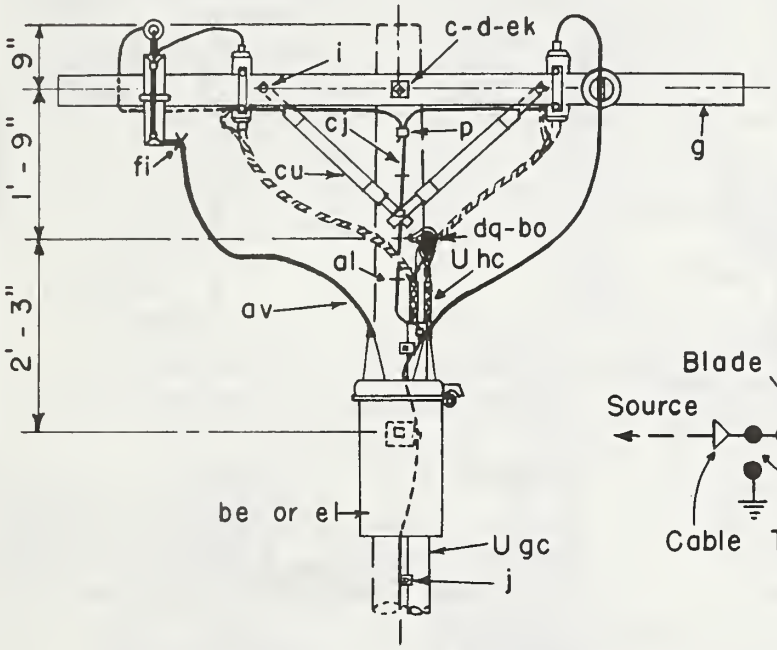
Dec. 1974		UM 3-16



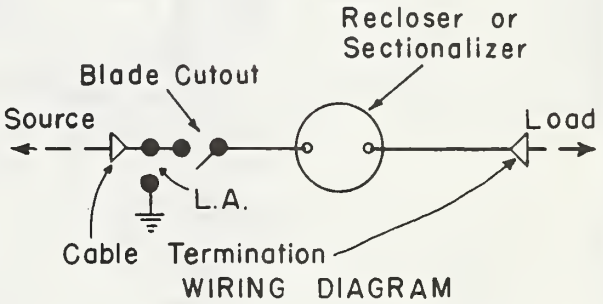
PLAN

Designate as:
UM3-40 Recloser Assembly.
UM3-41 Sectionalizer Assembly.

NOTE;
Use bracket fj if necessary to achieve clearance "B"



"B" minimum	
7.2/12.5 kV	15"
14.4/24.9 kV	20"



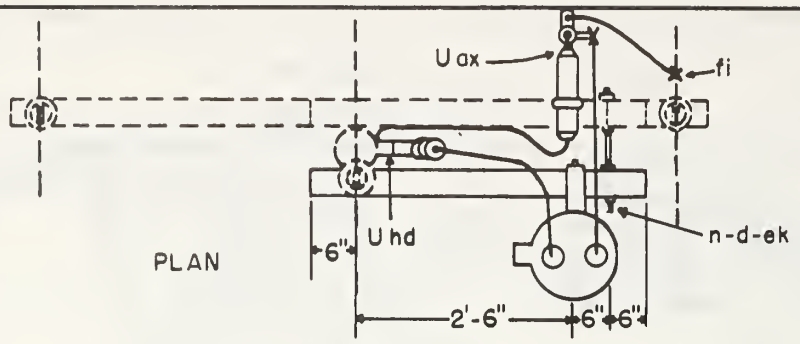
WIRING DIAGRAM

ITEM	NO.	MATERIAL	ITEM	NO.	MATERIAL
c	2	Bolt, mochine, 5/8" x required length	bo	1	Shockle, anchor
d	3	Washer, squore, 2 1/4"	cj		Groundwire, os required
g	1	Crossorm, 3 5/8" x 4 5/8" x 8'-0"	cu	2	Brace, wood, 28"
i	2	Bolt, carriage, 3/8" x 4 1/2"	eo	1	Insulotor, post type, and stud
j		Screw, log, 1/2" x 4", as required	ek		Locknuts, as required
dq	1	Eye screw, elliptical	el	1	Sectionolizer, (UM3-41)
p		Connectors, os required	fi	1	Connector, hot line, top ossembly
Uax	1	Cutout and single arrester	Ugc	1	Coble riser shield, length os required
		combination	Ugk	2	Coble terminotion
ov		Jumpers as required	Uhc	2	Coble support
be	1	Recloser, oil circuit, (UM3-40)	ol		Staples, os required
fj		Bracket, extension, as required	Uhd	2	Crossarm mounting bracket

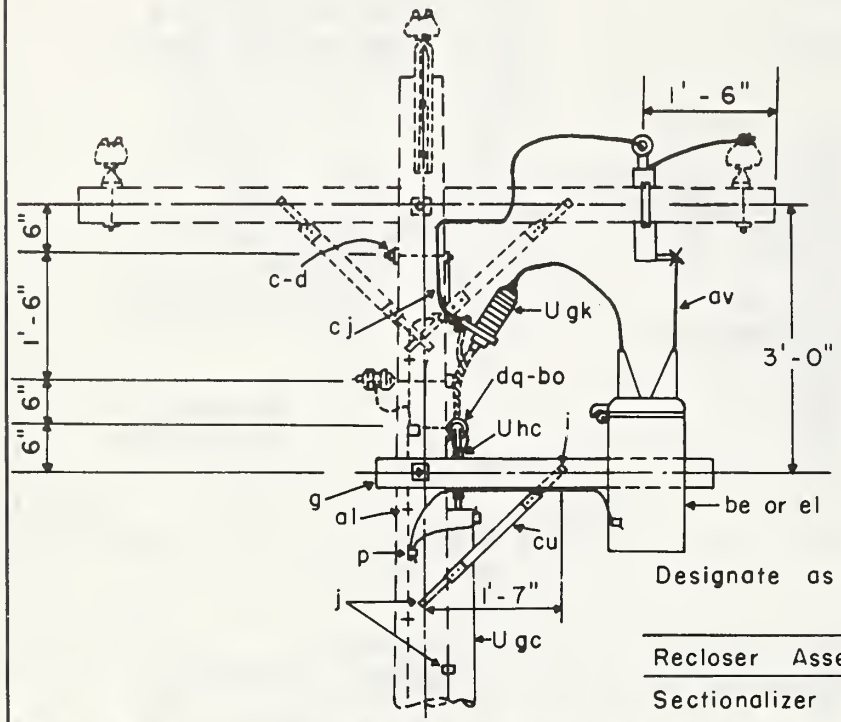
SINGLE-PHASE SECTIONALIZING INSTALLATION UNDERGROUND TO UNDERGROUND

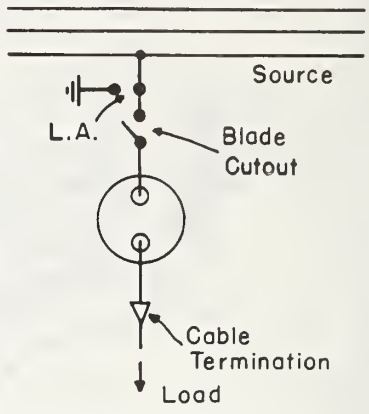
Dec. 1974

UM3-40, UM3-41



NOTE:
Total arrester lead length must be under 3 feet (See Bull. 61-3).





WIRING DIAGRAM

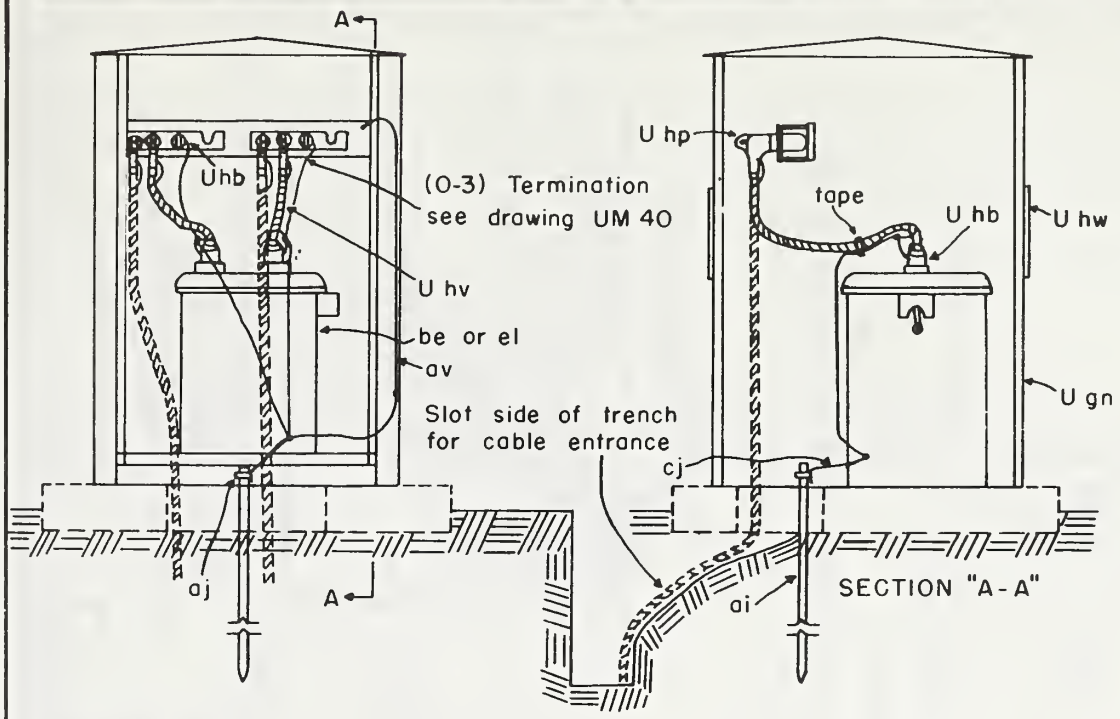
Designate as:

	Single Arrester	Parallel Arrester
Recloser Assembly	UM3-42	UM3-42A
Sectionalizer Assembly	UM3-43	UM3-43A

ITEM	NO.	MATERIAL	ITEM	NO.	MATERIAL
c	1	Bolt, machine, 5/8" x required length	dq	1	Eye screw, elliptical
p	5	Washer, square, 2 1/4"			
g	2	Crossarm, 3 5/8" x 4 5/8" x 4'-0"	ek		Locknuts, as required
i	2	Bolt, carriage, 3/8" x 4 1/2"	el	1	Sectionalizer (UM3-43, UM3-43A)
j		Screw, lag, 1/2" x 4", as required	fi	2	Connector, hot line, tap assembly
n	2	Bolt, double arming, 5/8" x required lgth.	Uax	1	Cutout and single arrester
p		Connectors, as required			combination (UM3-42, UM3-43)
al		Staples, as required	Uax	1	Cutout and parallel arrester
av		Jumpers, as required			combination (UM3-42A, UM3-43A)
be	1	Recloser, oil circuit (UM3-42, UM3-42A)	Ugc	1	Cable riser shield, length as req'd.
bo	1	Shackle, anchor	Ugk	1	Cable termination
cj		Ground wire, as required	Uhc	1	Cable support
cu	2	Brace, wood, 28"	Uhd	1	Bracket, pothead

THREE-PHASE, OVERHEAD SOURCE SINGLE-PHASE UNDERGROUND WITH RECLOSER OR SECTIONALIZER

Dec. 1974		UM3-42, UM3-42A UM3-43, UM3-43A



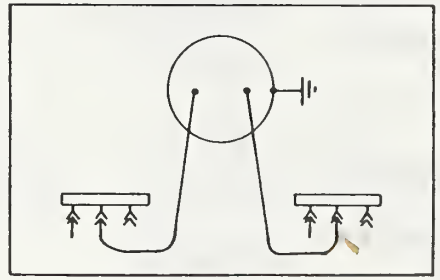
ITEM	NO.	MATERIAL
p		Connectors, as required
ai	1	Rod, ground, galvanized steel (for cathodic protection)
aj	1	Clamp, ground rod
av		Jumpers, as required
be	1	Recloser, oil circuit with bushing wells (UM 3-44)
el	1	Sectionalizer, with bushing wells (UM 3-45)
U gn	1	Enclosure with 2 multipoint terminations (O-3) and mounting bracket
U hv		Primary cable jumper, as required
U hw	2	Sign, warning
cj		Ground wire, as required
U hp	4	Elbow, load break
		Tape, as required
U hb	2	Cable lead connector, primary
U hb	2	Insulating cap

Designate as:

Recloser Assembly UM 3-44
Sectionalizer Assembly UM 3-45

NOTES:

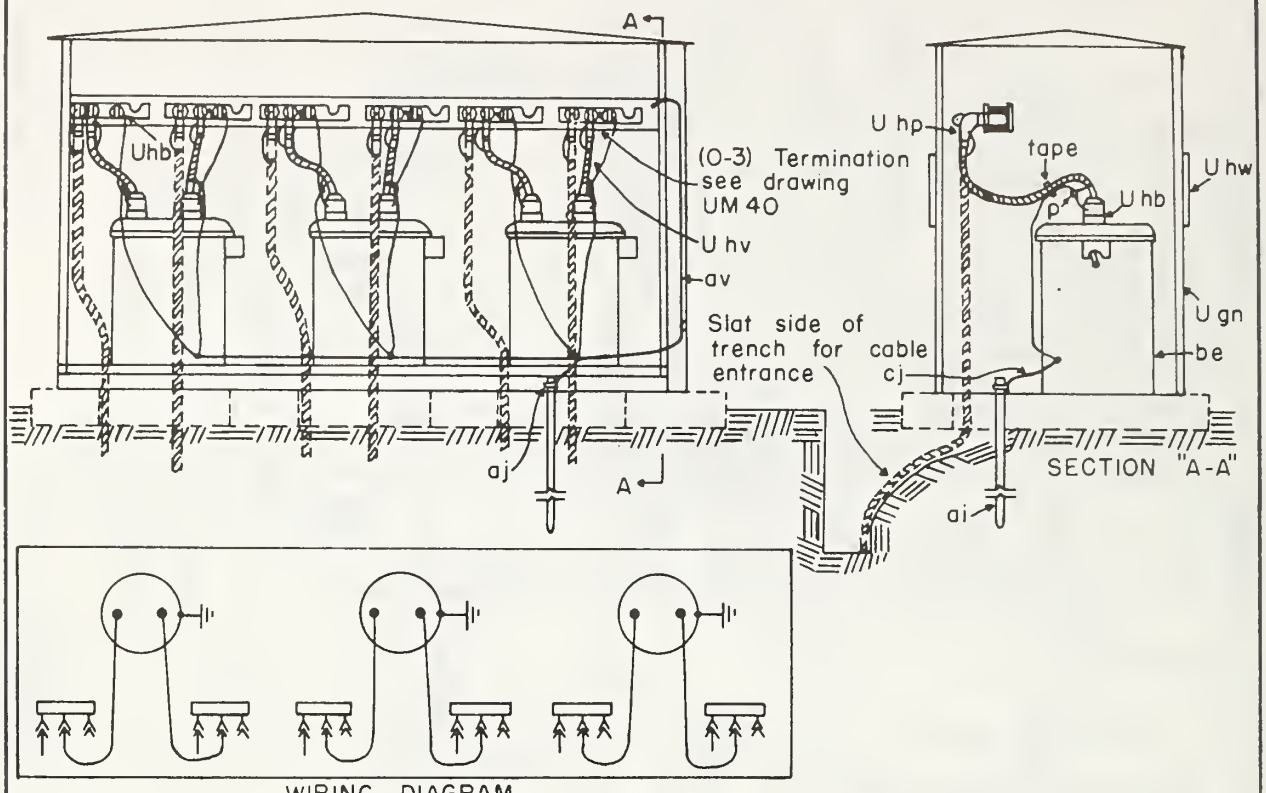
1. Provide sufficient slack in all cables to permit ready disconnection of elbow and mounting on parking stand.
2. Anchor unit to pad or enclosure.
3. Non-load break elbow (U hp) and bushing may be used in place of primary lead connector (U hb).



WIRING DIAGRAM

SINGLE-PHASE PAD-MOUNTED SECTIONALIZER OR RECLOSER

Dec. 1974		UM3-44, UM3-45



WIRING DIAGRAM

NOTES:

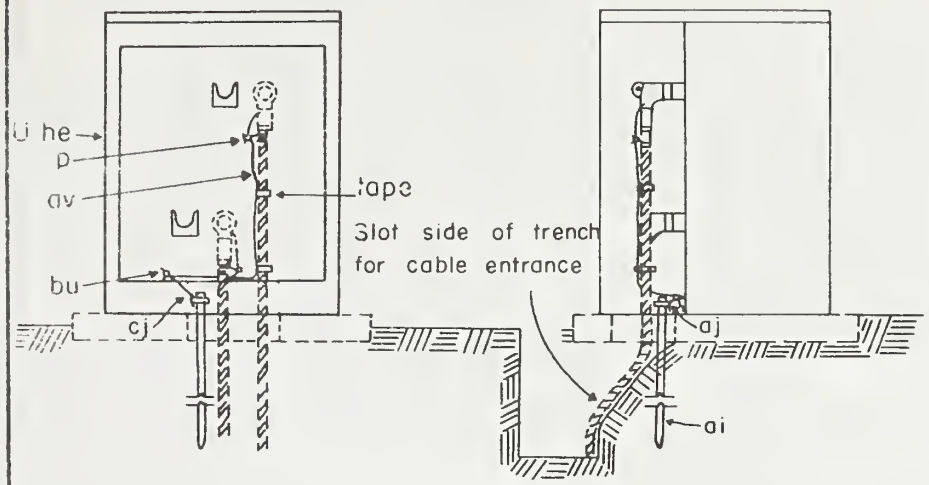
1. Provide sufficient slack in all cables ta permit ready discannectian of elbow and maunting on parking stand.
2. Anchar units to pad ar enclosure.
3. Nan-load break elbow (U hp) and bushing may be used in place af primary lead connector (U hb).

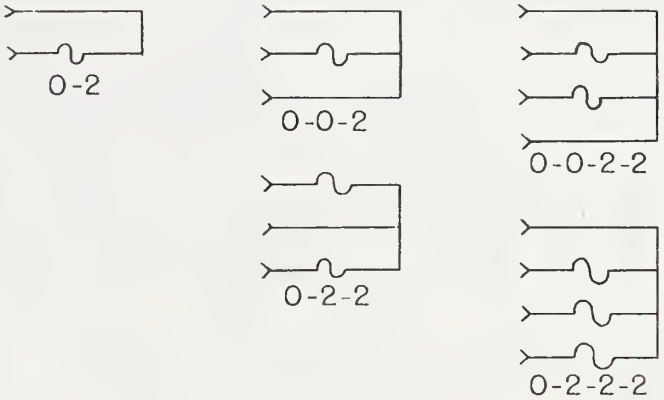
ITEM	NO.	MATERIAL	ITEM	NO.	MATERIAL
p		Connectors, as required	U hb	6	Cable lead connectar, primary
ai	1	Rad, graund, galvanized steel (far	U hp	12	Elbaw, laad break
		cathadic pratectian)	U hv		Primary cable jumper, as required
aj	1	Clamp, graund rod	Uhb	6	Insulating cap
av		Jumpers, as required	U hw	2	Sign, warning
be	3	Reclaser, ail circuit with bushing			Tape, as required
		wells			
cj		Graund wire, as required			
U gn	1	Enclosure with 6 multipoint			
		terminations (0-3) & mounting bracket			

THREE SINGLE – PHASE PAD – MOUNTED RECLOSERS

Dec. 1974

UM 3-46





CODE

- 0 Terminal
- 1 Switch & Terminal
- 2 Fuse & Terminal

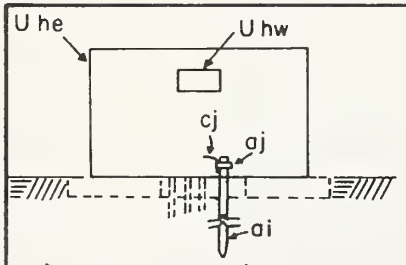
ITEM	NO.	MATERIAL
p		Connectors, as required
ai	1	Rod, ground, galvanized steel (for cathodic protection)
aj	1	Clamp, ground rod
av		Jumpers, as required
bu		Connector equipment ground, as required
cj		Ground wire, as required
Uhe	1	Enclosed sectionalizing assembly
Uhw	1	Sign, warning
		Tape, as required

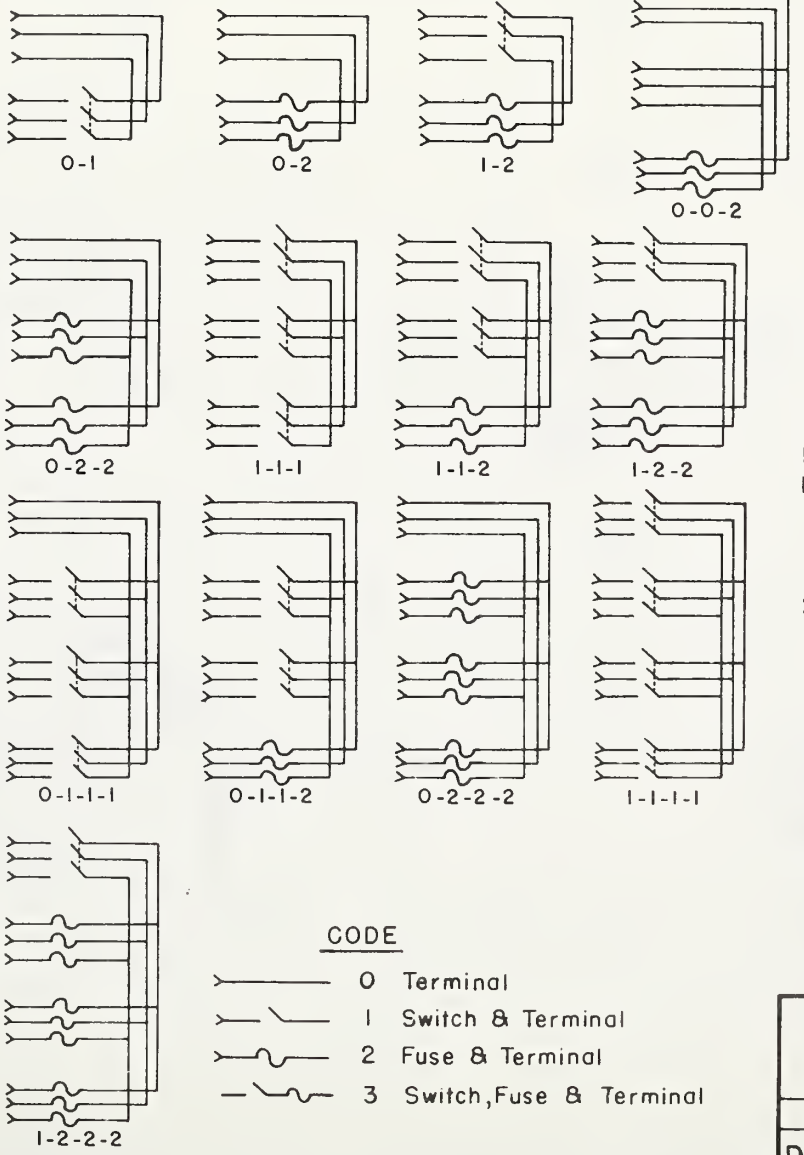
NOTES:

1. Load break elbows are not part of this unit. They should be specified separately.
2. Specify type of configuration desired by adding appropriate suffix.
3. Provide sufficient neutral slack to permit ready disconnection of elbow and mounting on parking stand.

SINGLE-PHASE PAD-MOUNTED SECTIONALIZING ASSEMBLY

Dec. 1974		UMS 3-1-( )





CODE

0 Terminal
1 Switch & Terminal
2 Fuse & Terminal
3 Switch, Fuse & Terminal

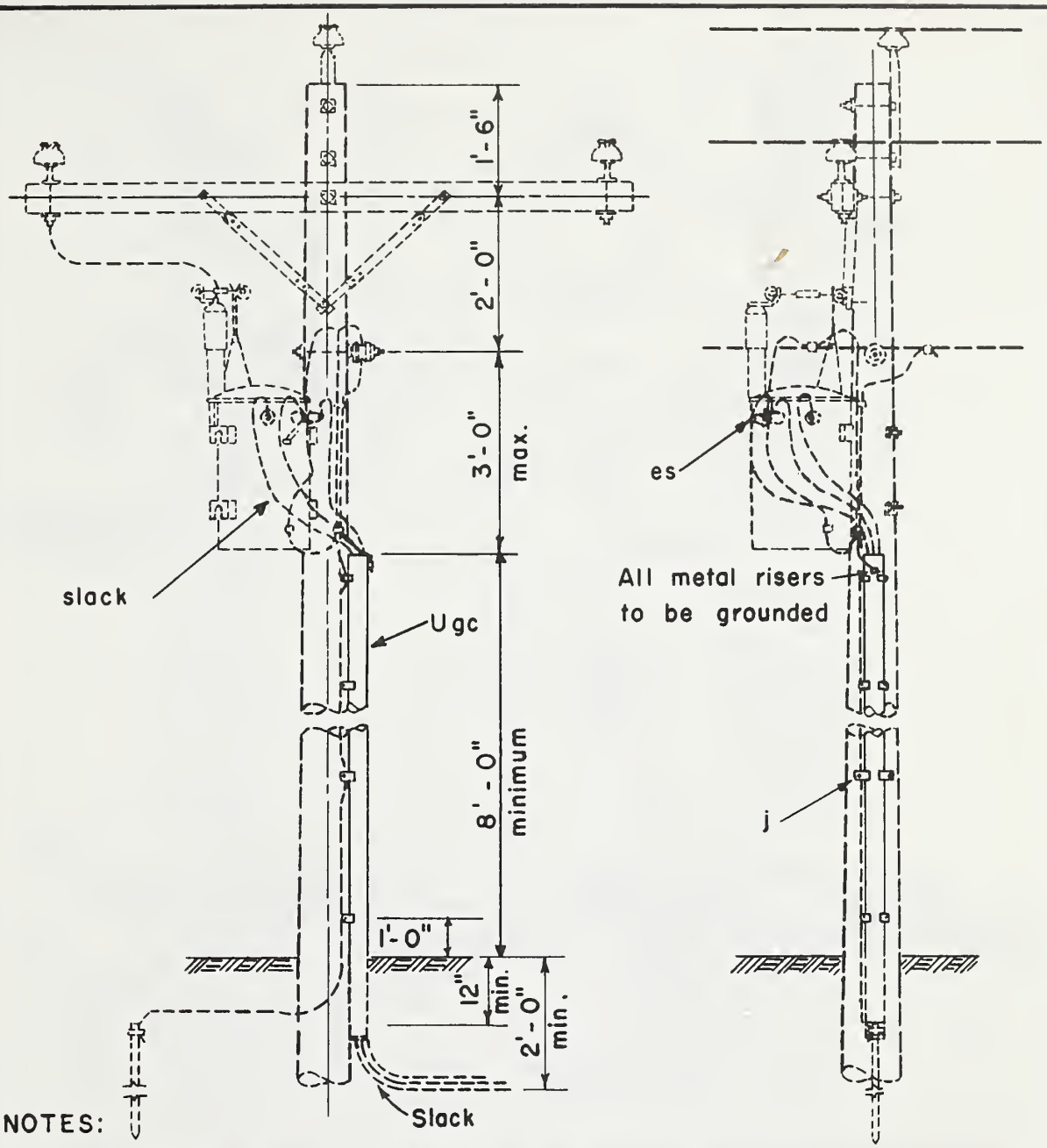
ITEM	NO.	MATERIAL
p		Connectors, as required
av		Jumpers, as required
bu		Connector equipment ground,
		as required
U he	1	Enclosed sectionalizing assembly
U hw	1	Sign, warning
		Tape, as required
ai	1	Rod, ground, galv. steel (for
		cathodic protection
aj	1	Clamp, ground rod
cj		Ground wire, as required

NOTES:

1. Load break elbows and cable terminations are not part of this unit. They should be specified separately if needed.
2. Specify type of configuration desired by adding appropriate suffix.
3. If load break elbows are used provide sufficient neutral slack to permit ready disconnection of elbow and mounting on parking stand.
4. If configuration desired is not shown the appropriate suffix can be constructed using the code.

THREE-PHASE PAD-MOUNTED SECTIONALIZING ASSEMBLY 200 & 600 AMPERES MAXIMUM

Dec. 1974		UMS 3-3-( )



NOTES:

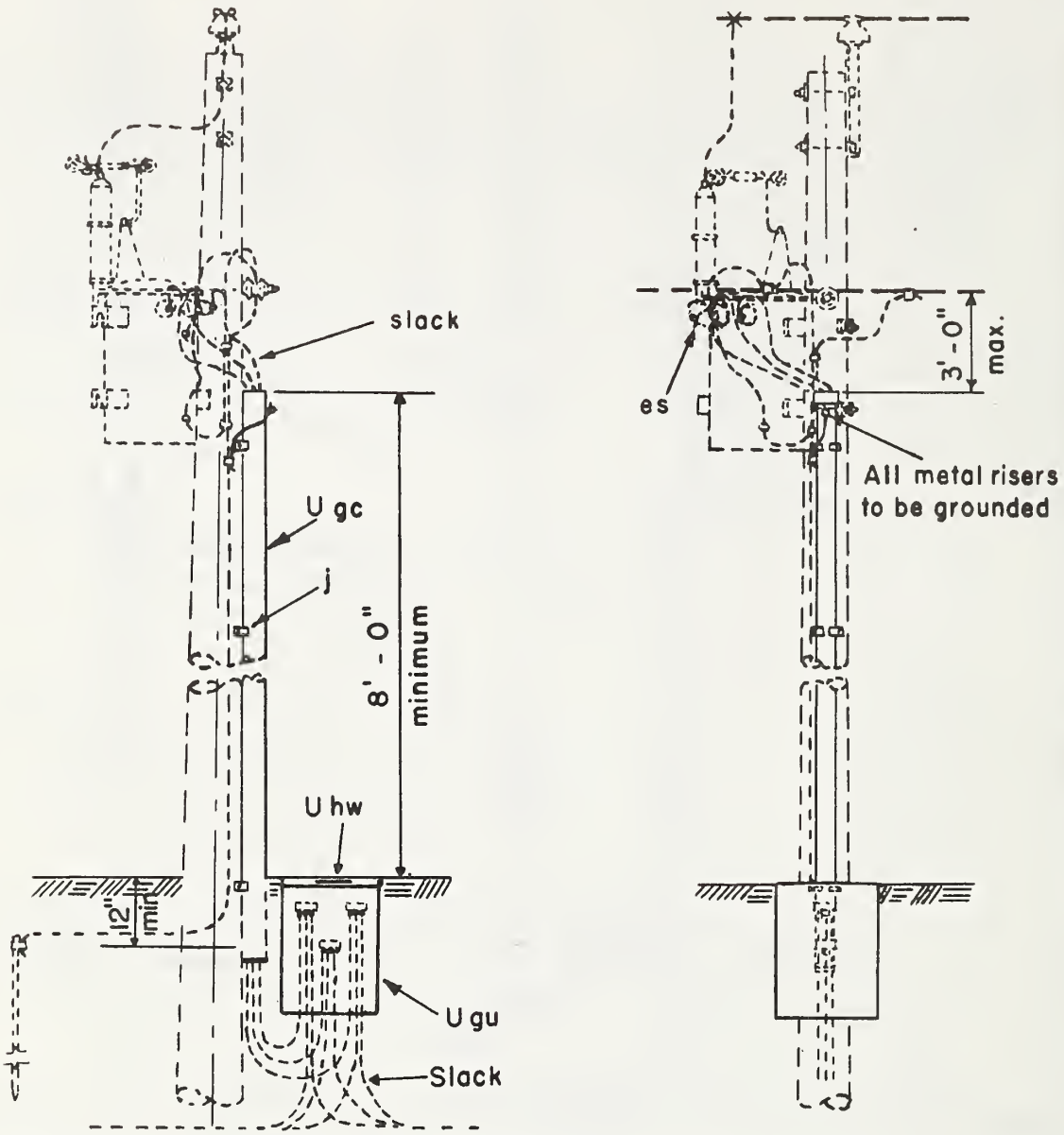
1. Dress or seal secondary cables to prevent entrance of moisture at transformer terminals.
2. Slack shall be provided to prevent damaging strain on cable after backfilling.

ITEM	NO.	MATERIAL		ITEM	NO.	MATERIAL	
j		Screw, lag, 1/2" x 4", as required					
Ugc	1	Cable riser shield, length as req'd		es		Moisture seal	

7.2/12.5 KV. SINGLE - PHASE SECONDARY CABLE TERMINAL POLE

Dec. 1974

UM5



NOTE:

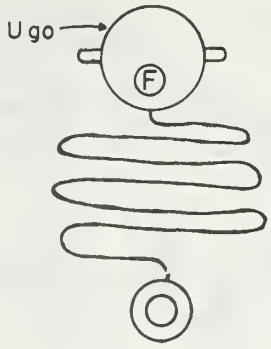
Dress or seal secondary cables to prevent entrance of moisture at transformer terminals.

ITEM	NO.	MATERIAL	ITEM	NO.	MATERIAL
j		Screw, lag, 1/2" x 4", as required	U gu		Power pedestal
U gc		Cable riser shield, length as required	U hw		Sign, warning
			es		Moisture seal

GUIDE FOR SECONDARY CABLE TERMINAL POLE MULTIPLE SERVICES

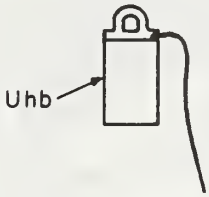
Dec. 1974

UM5-5

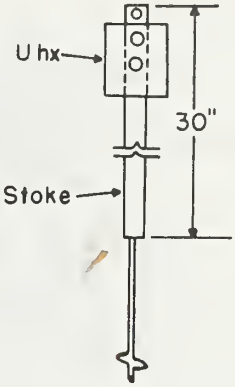


UM 6-4

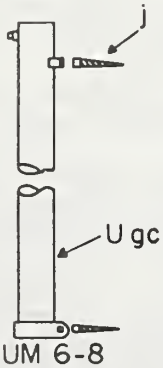
UM 6-6



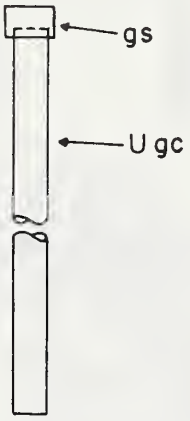
UM6-11



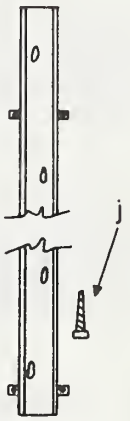
UM 6-12



UM 6-8



UM6-9



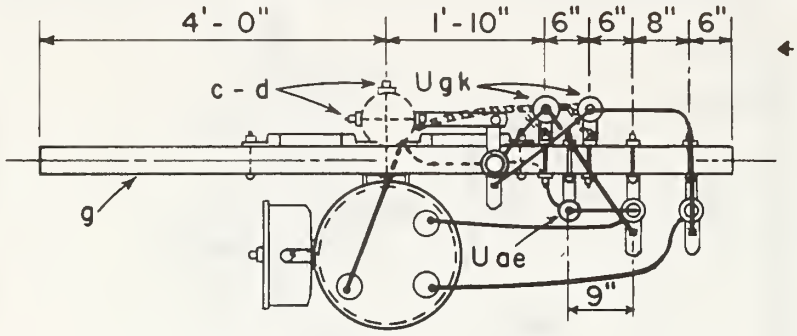
UM 6-18

NOTE:
Length and diameter of UM6-8 and UM6-9 as specified.

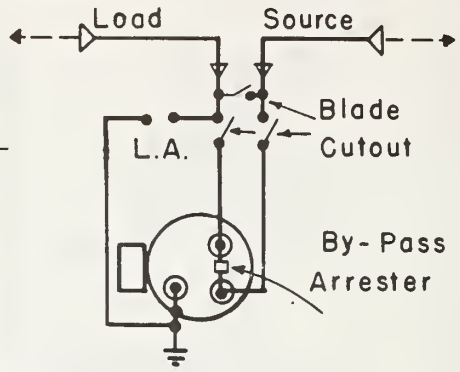
ITEM	MATERIAL	UM6-4	UM6-6	UM6-8	UM6-9	UM6-11	UM6-12	UM6-18
j	Screw, lag, 1/2" x 4"			as req'd.				as req'd.
Uhb	Insulating cap					1		
ai	Rod, ground, galvanized steel		1					
aj	Clamp, ground rod		1					
av	Jumper, No.6 min. copper equiv.		os req'd.					
gs	Conduit coupling				1			
Uhx	Cable route marker						1	
Ugc	Conduit				1			
Ugc	Riser shield			1				
Ugo	Fault indicotor	1						
	Stake						1	
	Conduit straps			os req'd.				
	Backing plate							1

MISCELLANEOUS ASSEMBLIES
UNDERGROUND CABLE

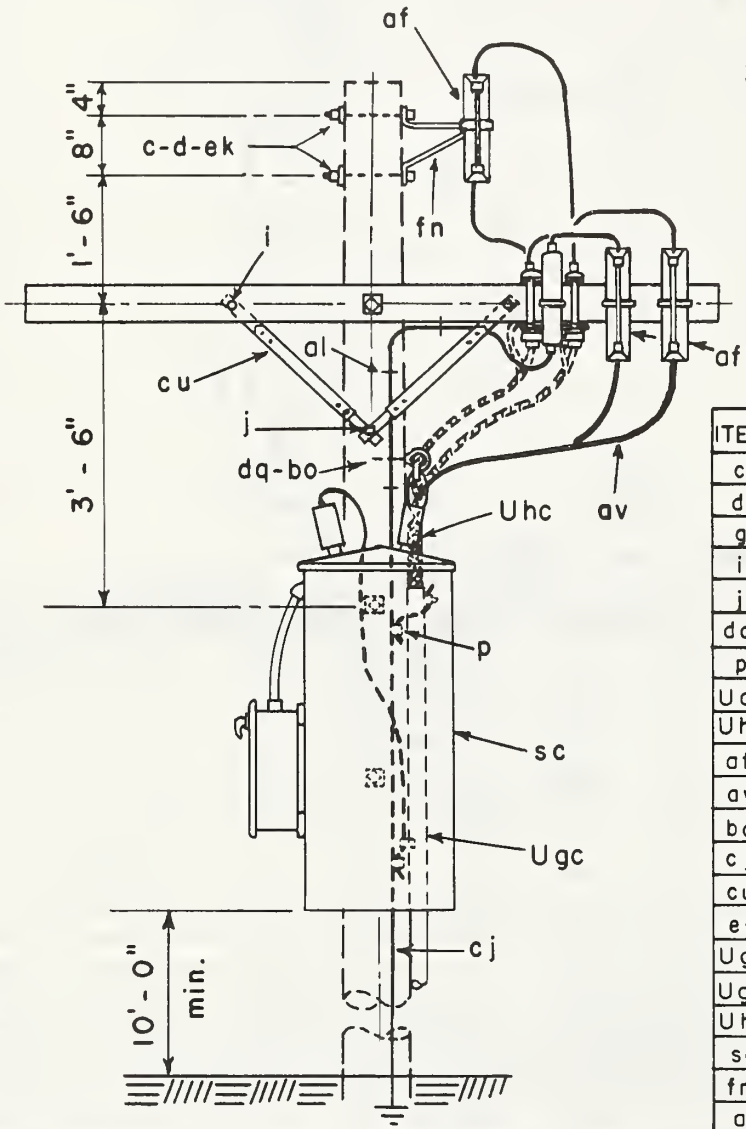
Dec. 1974	UM6-4, UM6-6, UM6-8, UM6-9, UM6-11, UM6-12, UM6-18



PLAN



WIRING DIAGRAM



NOTES:

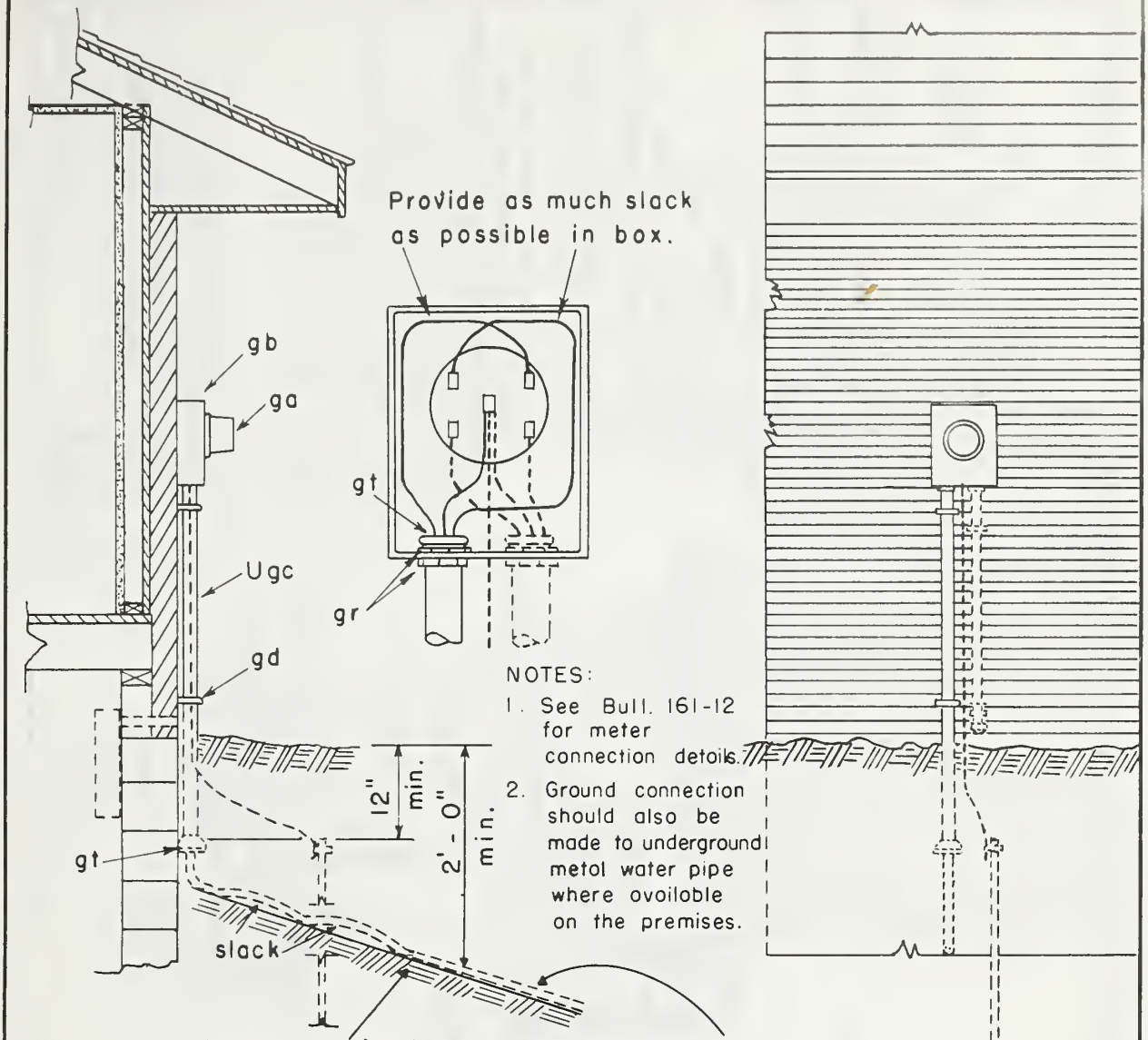
1. Three of these assemblies may be used for three phase installation.
2. Pole mounted cutout is normally open.
3. Total arrester lead length must be under 3 feet (See Bull. 61-3).

ITEM	NO.	MATERIAL
c	5	Bolt, machine, 5/8" x req'd. length
d	6	Washer, square, 2 1/4"
g	1	Crossarm, 3 5/8" x 4 5/8" x 8' - 0"
i	2	Bolt, carriage, 3/8" x 4 1/2"
j		Screw, lag, 1/2" x 4" as req'd.
dq	1	Eye screw, elliptical
p		Connectors, as required
Uae	1	Lightning arrester, distr. type
Uhd	2	Crossarm mounting bracket
af	3	Cutout, blade type
av		Jumpers , as required
ba	1	Shackle, anchor
cj		Ground wire, as required
cu	2	Brace, woad, 28"
ek		Locknuts
Ugc	1	Cable riser shield, length as req'd.
Ugk	2	Cable termination
Uhc	2	Cable support
sc	1	Regulator, step type
fn	1	Bracket, cutout, extension
al		Staples, as required

SINGLE-PHASE REGULATOR ASSEMBLY WITH BY-PASS SWITCHING FUNCTION UNDERGROUND TO UNDERGROUND

Dec. 1974

UM7 - 1



NOTES:

1. See Bull. 161-12 for meter connection details.
2. Ground connection should also be made to underground metol water pipe where ovoiloble on the premises.

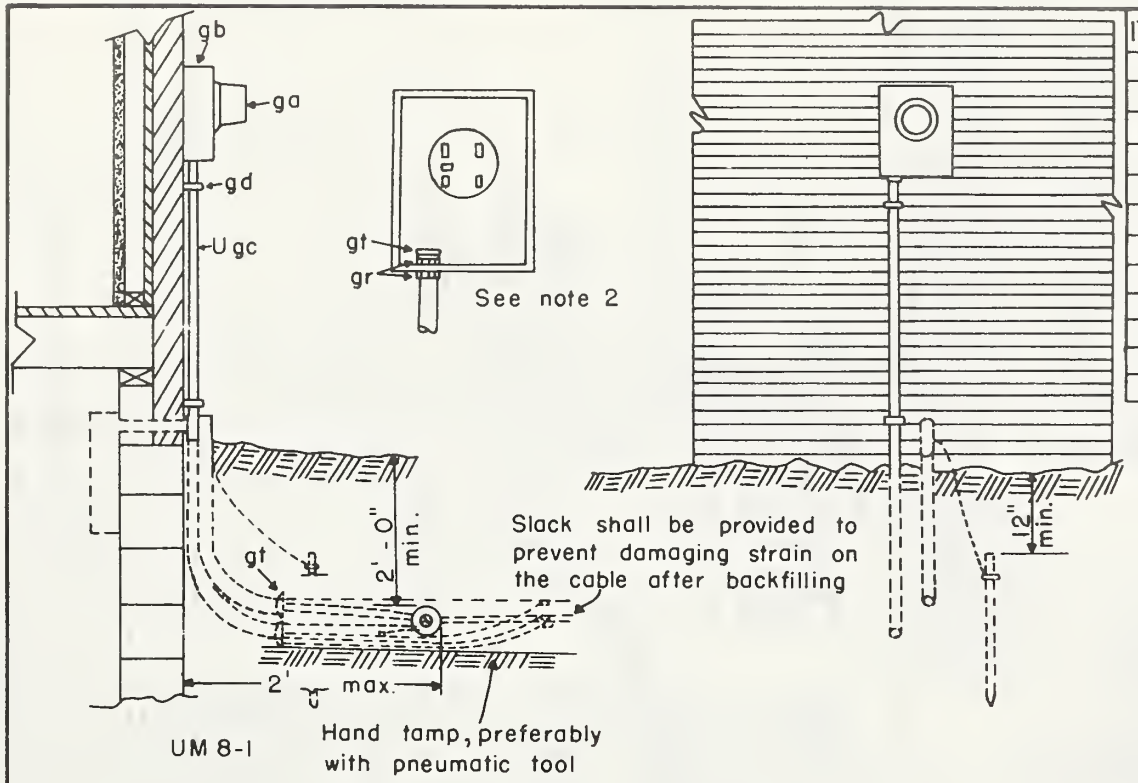
ITEM	NO.	MATERIAL	ITEM	NO.	MATERIAL
ga	1	Meter			
gb	1	Meter socket			
Ugc	1	Conduit, dia. and length as required			
gd	2	Pipe strap			
gr	2	Conduit locknuts, size as required			
gt	2	Insulated bushing, size as required			

METER INSTALLATION GUIDE

UNDERGROUND SOURCE

Dec. 1974

UM 8

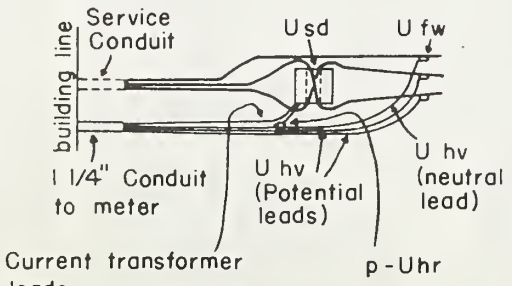


UM 8-1

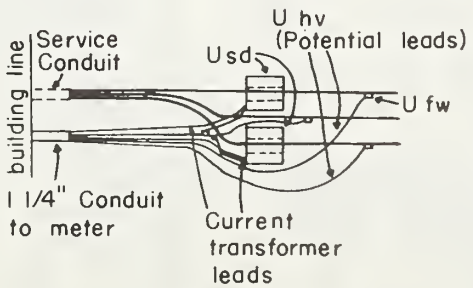
ITEM	NO.	MATERIAL
ga	1	Meter
gb	1	Meter socket
gd	2	Pipe strap
gr	2	Conduit locknuts, size as required
gt	2	Insulated bushing, size as required
U fw	3	Secondary tap connector
U gc	1	Conduit, dia. and length as required
U hv		*10 cu., USE 600v. secondary cable
U sd	1	Current transformer (UM 8-1)
U sd	2	Current transformers (UM 8-2)
U hr		Submersible secondary tap cover, as req'd.
p		Connectors, as required

NOTE:

1. Current transformer leads not to exceed 14' - 0" in length.
2. See Bull. 161-12 for meter and current transformer connection details.
3. Ground connection should also be made at service entrance location.
4. Ground connection should also be made to underground metal water pipe where available on the premises.



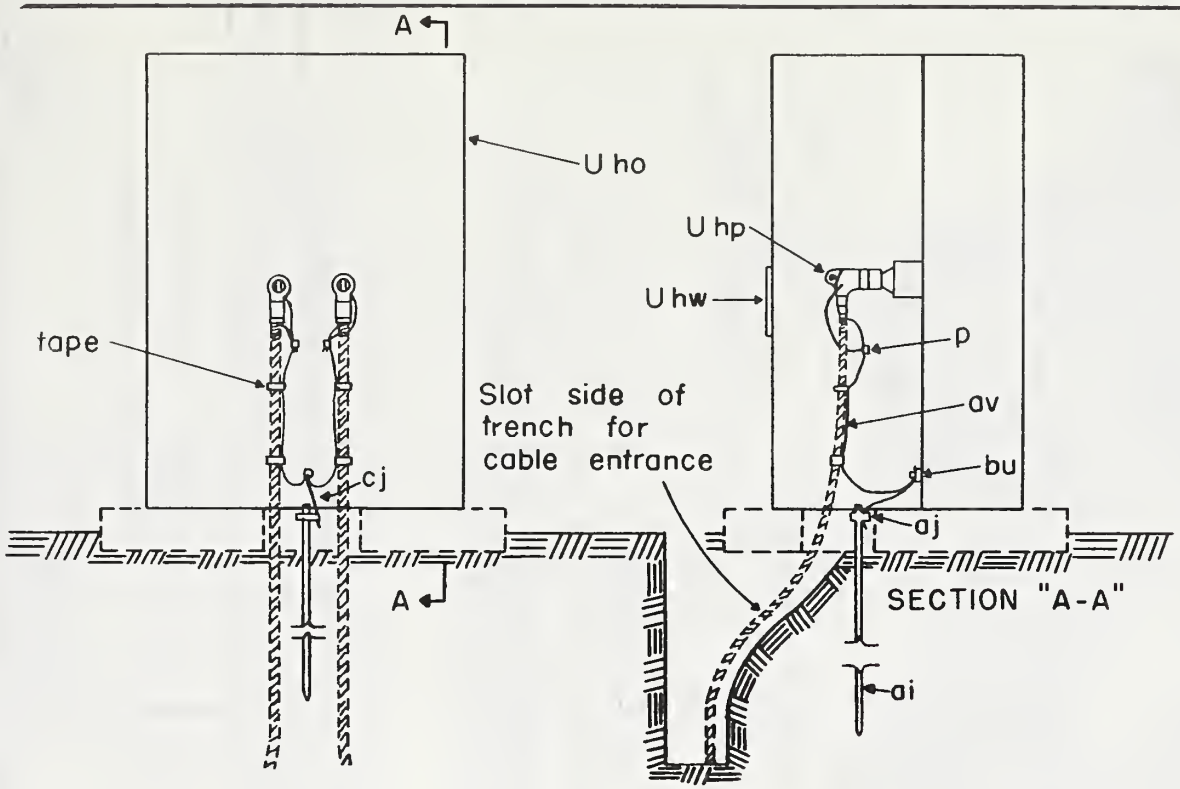
UM 8-1



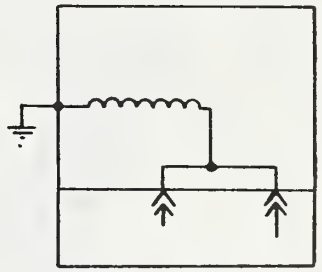
UM 8-2

METER INSTALLATION GUIDE
UNDERGROUND SOURCE
WITH CURRENT TRANSFORMER(S)

Dec. 1974		UM 8-1, UM 8-2

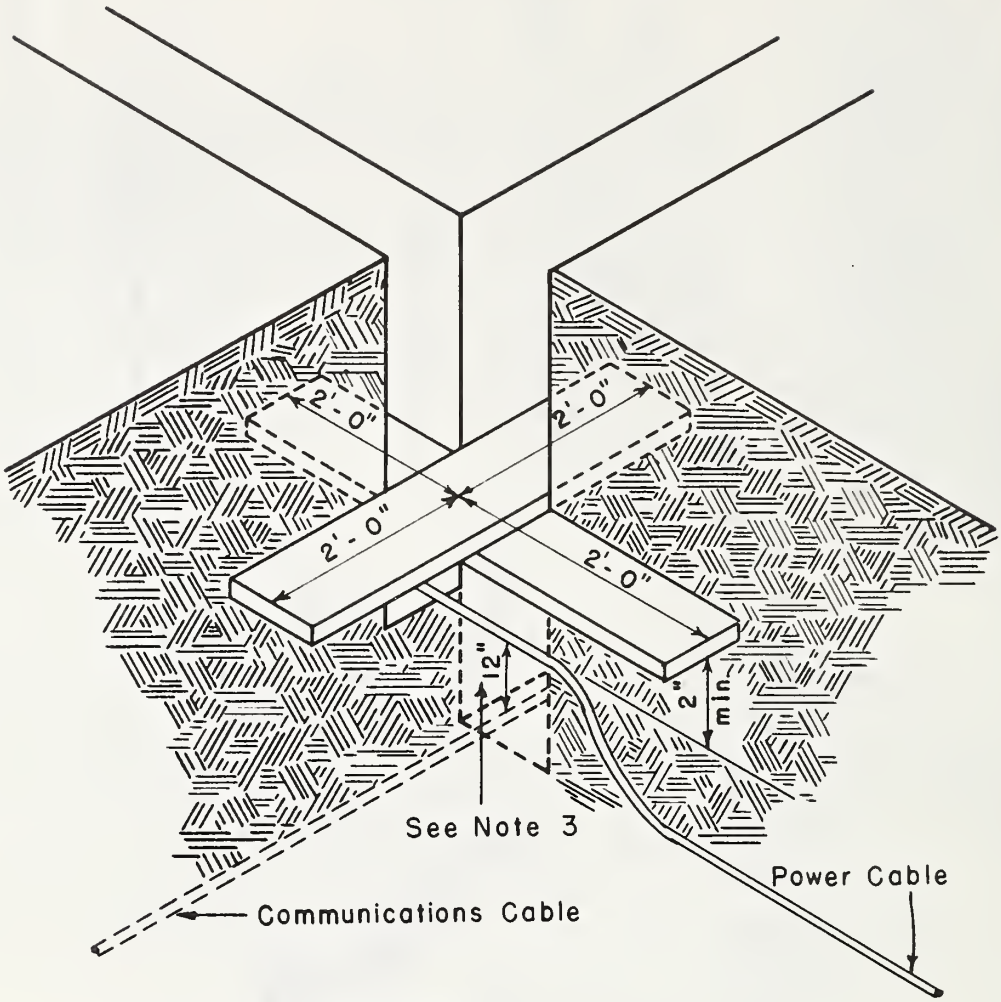


ITEM	NO.	MATERIAL
p		Connectors, as required
av		Jumpers, as required
bu	1	Connector, equipment ground
U ho	1	Reactor, pad-mount
U hp	2	Elbow, load break
U hw	1	Sign, warning
		Tape, as required
ai	1	Rod, ground, galv. steel (for
		cathodic protection)
aj	1	Clamp, ground rod
cj		Ground wire, as required



WIRING DIAGRAM

SINGLE - PHASE PAD-MOUNTED REACTOR		
Dec. 1974		UM 9 - 1



NOTES:

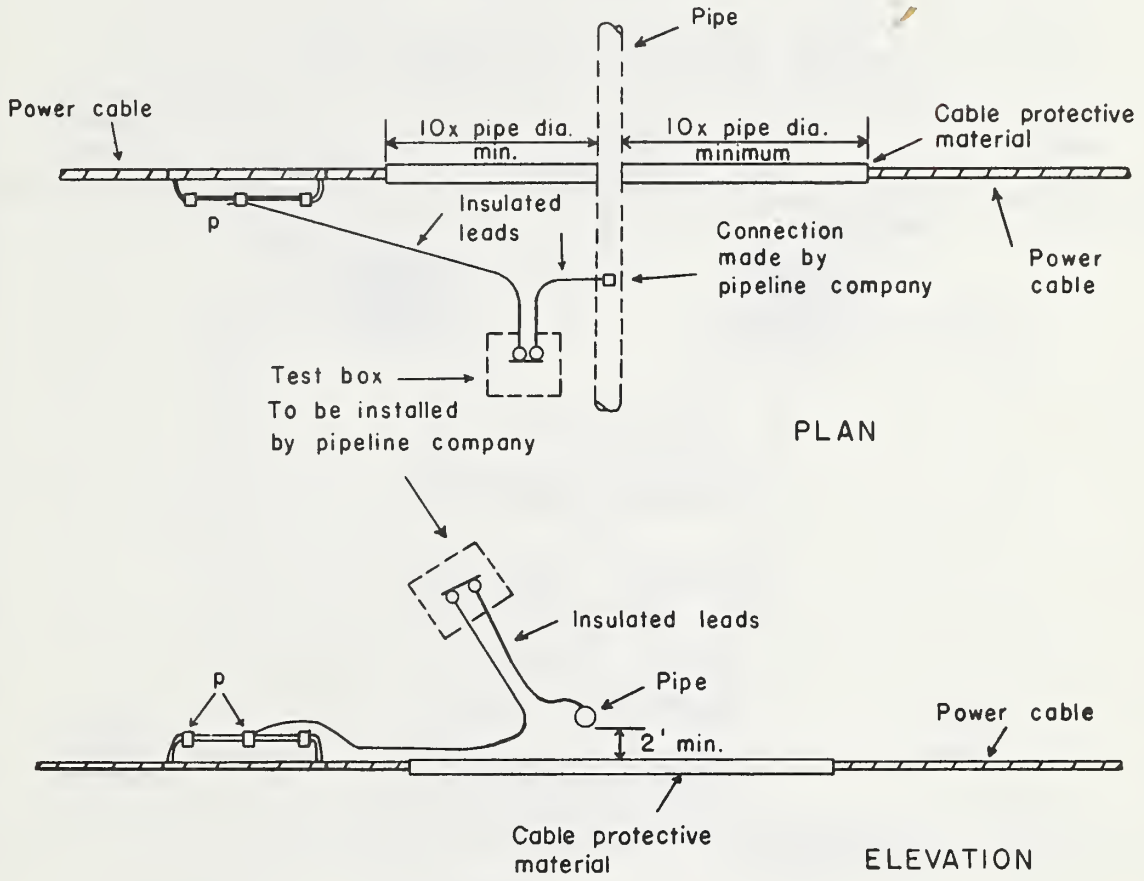
1. All planks to be treated as per REA specifications.
2. Planks must be free from preservative bleeding.
3. This construction required only when power cable crosses over communications cable.

ITEM	NO.	MATERIAL	ITEM	NO.	MATERIAL
	2	Plank, 2" x 6" x 4'-0" long			

CABLE CROSSING
PROTECTION ASSEMBLY

Dec. 1974

UM 10

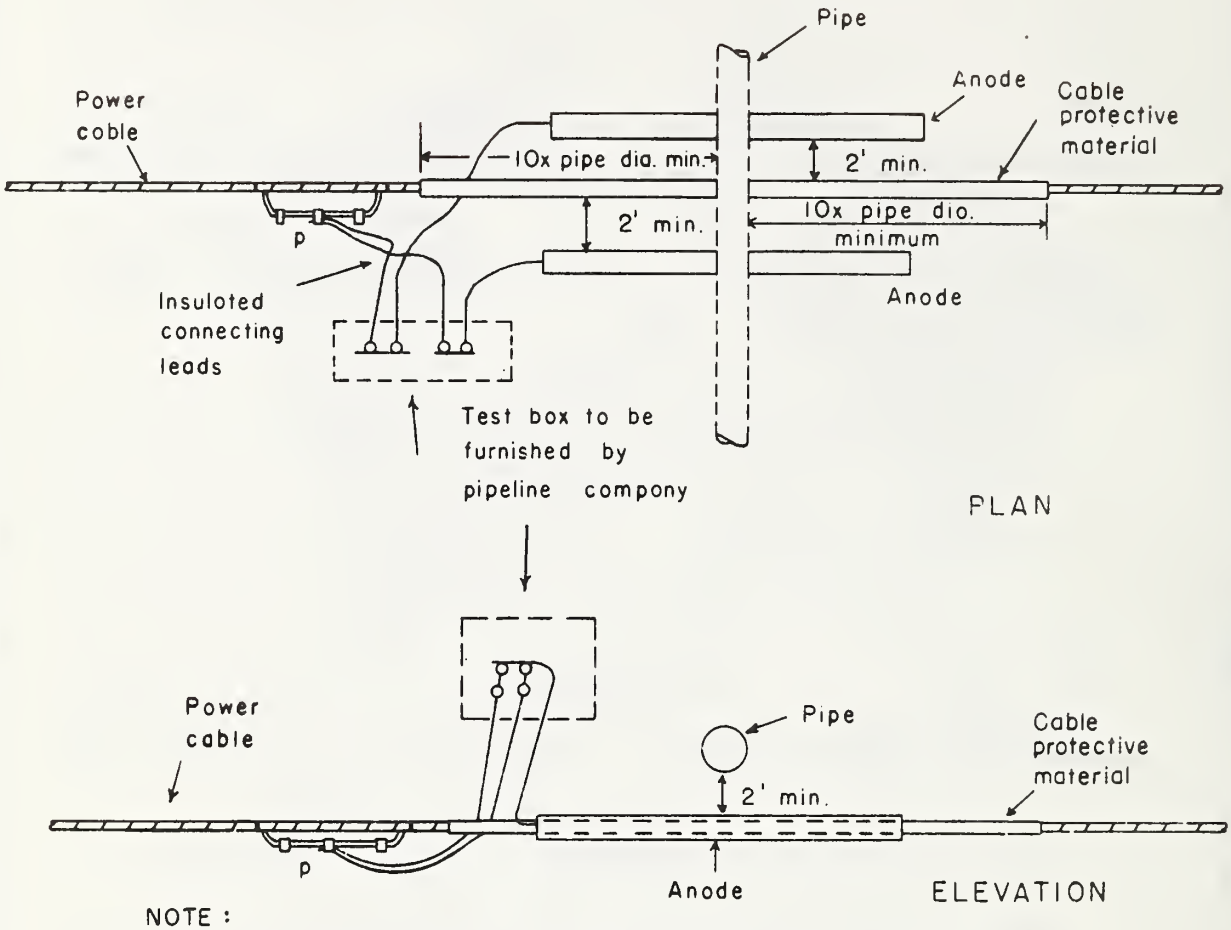


NOTE :
Install concentric neutral extension and No. 14 AWG bare tinned copper wire as in a primary splice, UM 45-1.

ITEM	MATERIAL
	Cable protective material, as specified
p	Connectors, compression or percussion, as required
av	Jumpers, as required

UNDERGROUND CABLE AND PIPELINE CROSSING WITH INTERFERENCE BOND

Dec. 1974		UM 11



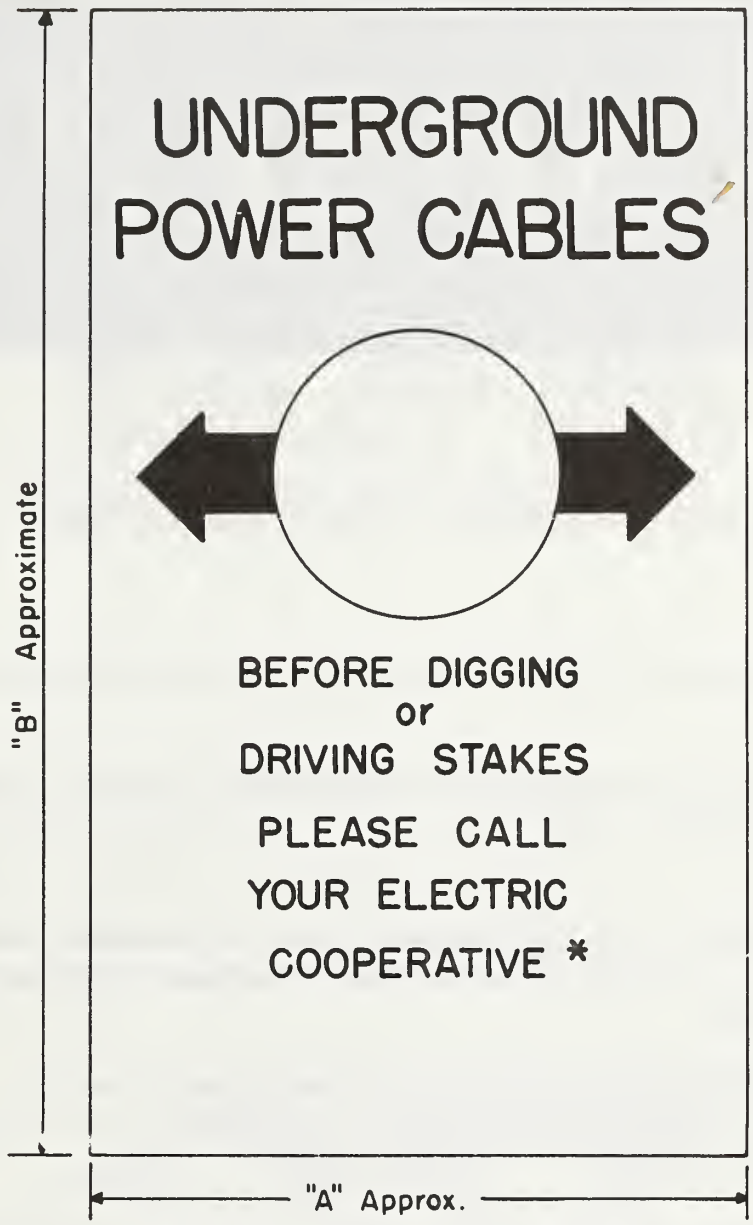
NOTE :
Install concentric neutral extension and No. 14 AWG bare tinned copper wire as in a primary splice, UM 45-1.

ITEM	NO.	MATERIAL
		Cable protective material, as specified
p		Connector, compression or percussion, as required
av		Jumper, as required
Usi	2	Anode, sacrificial size and type _____ insulated lead length, as required

UNDERGROUND CABLE AND PIPELINE CROSSING WITH SACRIFICIAL ANODE

Dec. 1974

UM 11-1



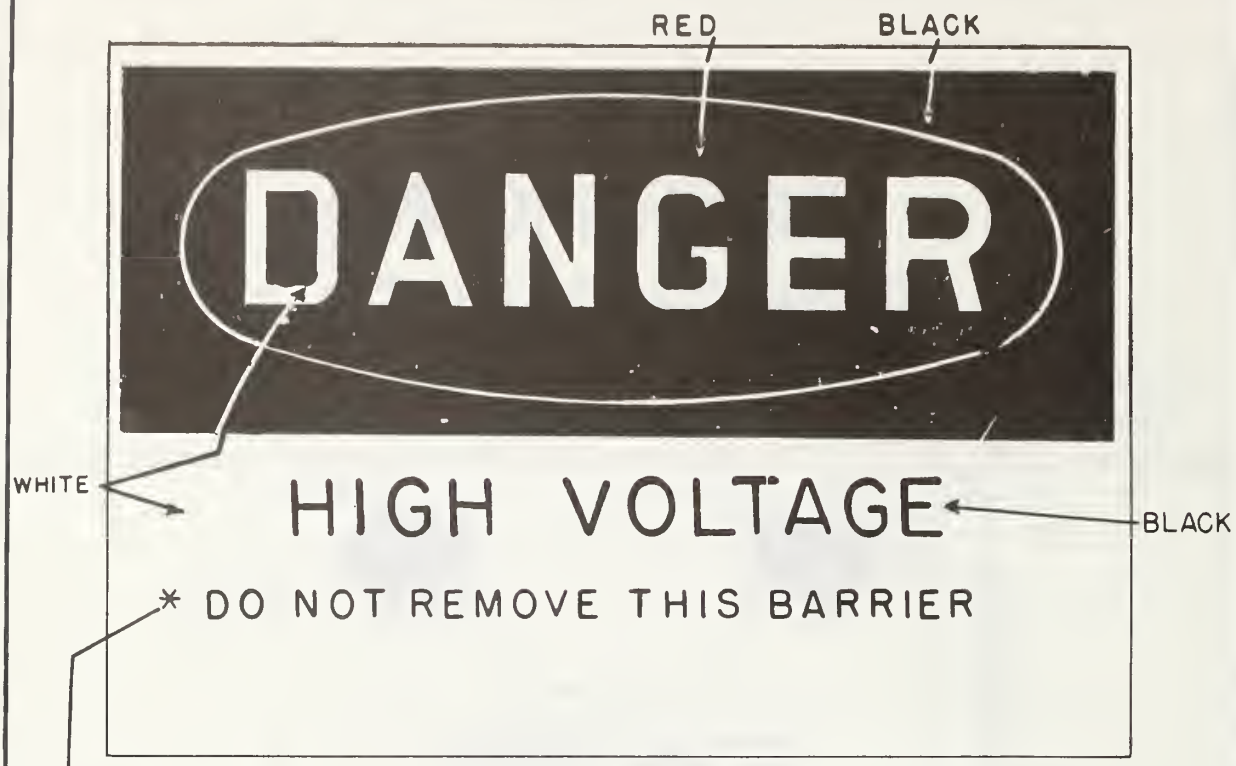
* Cooperative name and telephone number may be inserted as an alternate.

NOTE:
Sign shall have a yellow back ground with black letters.

INCHES		
A	4	7
B	5	12

WARNING SIGN

Dec. 1974		UM 12



* Wording should be appropriate for hazard and may include system identification.

NOTE:

Danger signs should be used only where an immediate hazard exists, for example, on barriers guarding exposed high voltage parts. (Item Uhw)

STANDARD PROPORTIONS All DIMENSIONS IN INCHES			
Sign Size Height x Width	Black Rectangular Panel Height x Width	Red Oval Height x Width	Word Danger Height
7 x 10	3 1/4 x 9 3/8	2 7/8 x 8 1/2	1 7/16
10 x 14	4 5/8 x 1 3 3/8	4 1/8 x 1 1 7/8	2 1/16
14 x 20	6 1/2 x 19 3/8	5 3/4 x 17	2 7/8.
20 x 28	9 1/4 x 27 3/8	8 1/4 x 23 7/8	4 1/8

WARNING SIGN GUIDE

DANGER

Dec. 1974

UM 12 - 1

* Wording should be appropriate for hazard and may include system identification.

NOTE:

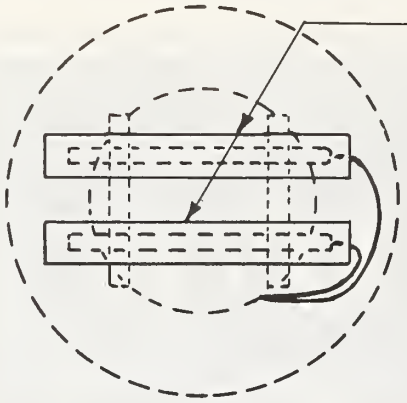
Caution signs shall be used only to warn against potential hazards, for example, on exterior of pad-mounted equipment.

(Item Uhw)

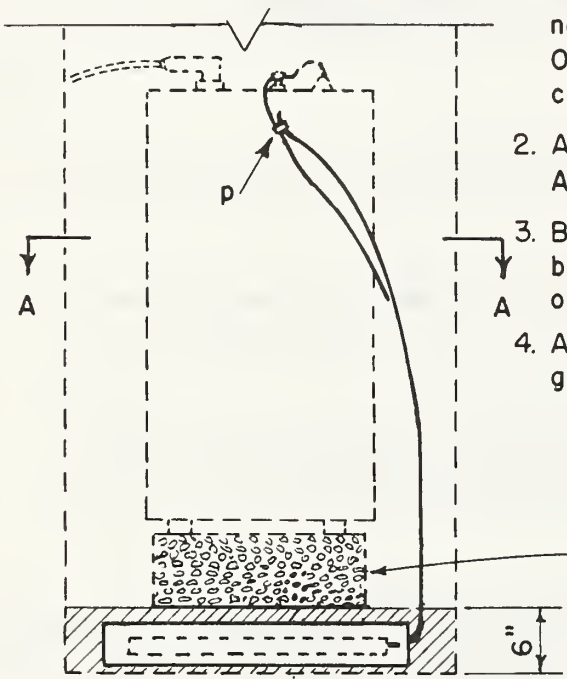
STANDARD PROPORTIONS All DIMENSIONS IN INCHES							
Sign Size			Black Rectangular Panel			Word Caution
Height		Width	Height		Width	Height
7	x	10	2 1/4	x	9 3/8	1 5/8
10	x	14	3 1/4	x	13 3/8	2 1/4
14	x	20	3 3/4	x	19 3/8	2 3/4
20	x	28	4 1/4	x	27 3/8	3 1/4

WARNING SIGN GUIDE

CAUTION



SECTION "A – A"



NOTES:

1. Each zinc anode to be 1.4" sq. x 24" long. Shall be special high grade zinc with not more than 0.0014 % iron, not more than 0.006 % lead and not more than 0.005 % copper after casting.
2. Anode to have 6'-6" long lead No. 6 AWG TW silver soldered to anode core.
3. Backfill package of 50 % gypsum, 50% bentonite in cloth package to be supplied on anode.
4. Anode leads to be connected to tank ground.

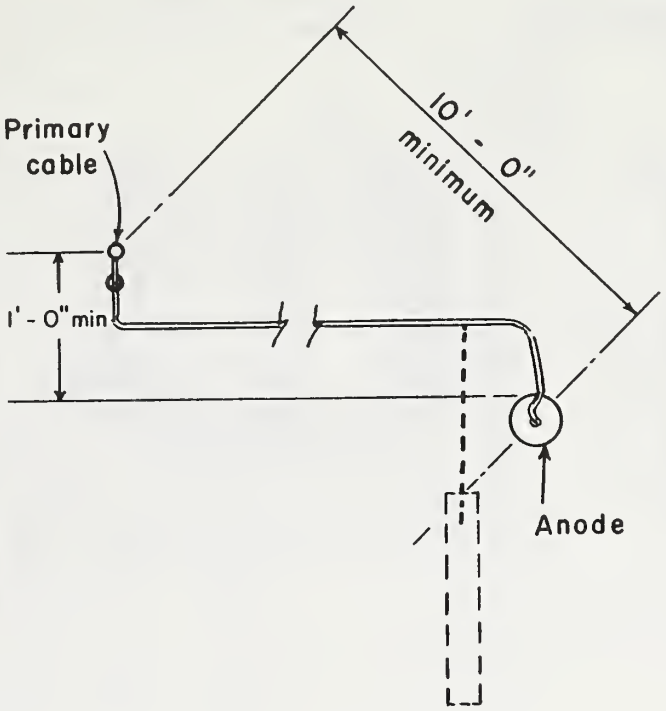
ITEM	NO.	MATERIAL	ITEM	NO.	MATERIAL
p		Connectors, as required			Backfill, as required
U si	2	Anode, zinc			

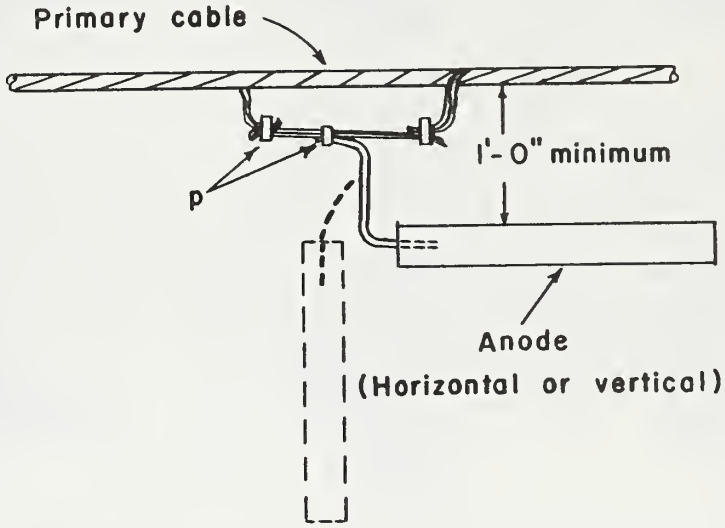
SACRIFICIAL ANODE
FOR SUBMERSIBLE TRANSFORMER

Dec. 1974

UM26

ITEM	NO.	MATERIAL
p		Connector, compression or percussion, as required
Usi	1	Anode, sacrificial size and type ____ insulated lead
		length, as required
av		Jumper



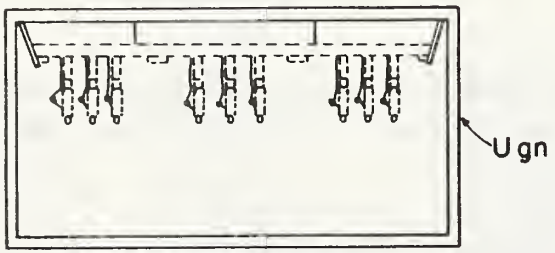


NOTE:

Install concentric neutral extension and No. 14 AWG bare tinned copper wire as in a primary cable splice, UM45-1.

SACRIFICIAL ANODE
FOR UNDERGROUND PRIMARY CABLE

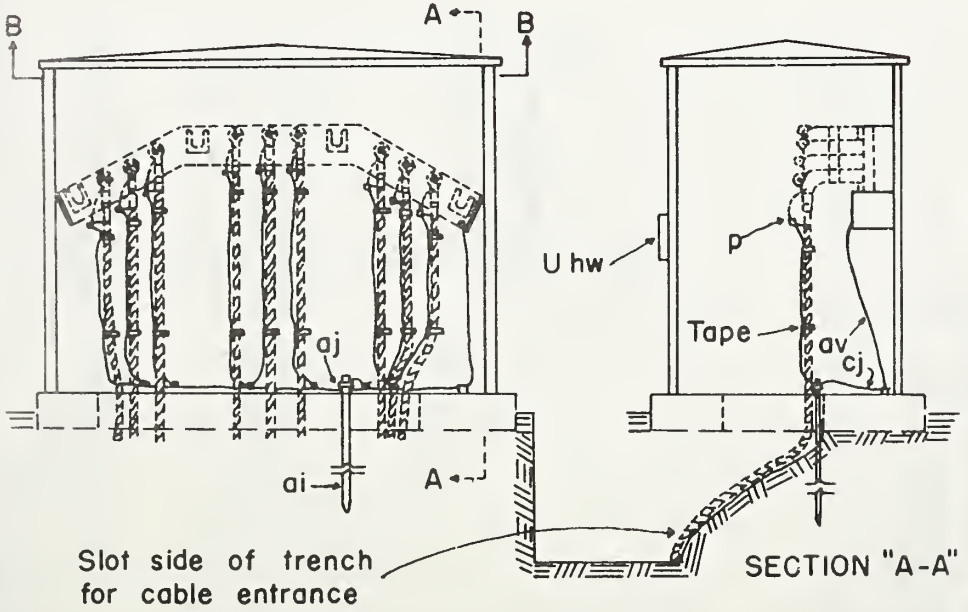
Dec. 1974		UM 27



SECTION "B-B"

NOTES:

1. This assembly is for all multi-phase sectionalizing points for load currents to 200 amperes.
2. Multipoint termination assemblies must be specified separately. See drawing UM 40.
3. Load break elbows and fused load break elbows are not part of this assembly unit. They should be specified separately.
4. All neutrals and metallic non-current carrying parts shall be interconnected and grounded.



SECTION "A-A"

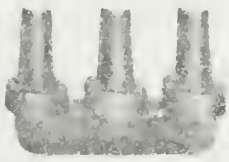
ITEM	NO.	MATERIAL
p		Connectors, as required
ai	1	Rod, ground, galvanized steel (for cathodic protection)
aj	1	Clamp, ground rod
av		Jumpers, as required
cj		Ground wire, as required
Ugn	1	Enclosure with mounting attachments
Uhw	1	Sign, warning
		Tape, as required

MULTI-PHASE PAD-MOUNTED SECTIONALIZING ASSEMBLIES 7.2/12.5 kV, 200 AMPERES MAXIMUM

Dec. 1974

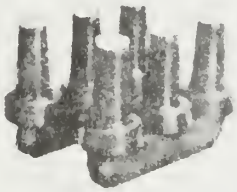
UM 33

UM 40 - (0-2)

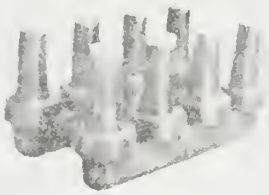


UM 40-(0-3)

UM 40 - (0-4)



UM 40-(0-6)



UM 40 - (0-8)

UM 40 - (1-1)

UM 40 - (1-2)

UM 40 - (2-1)

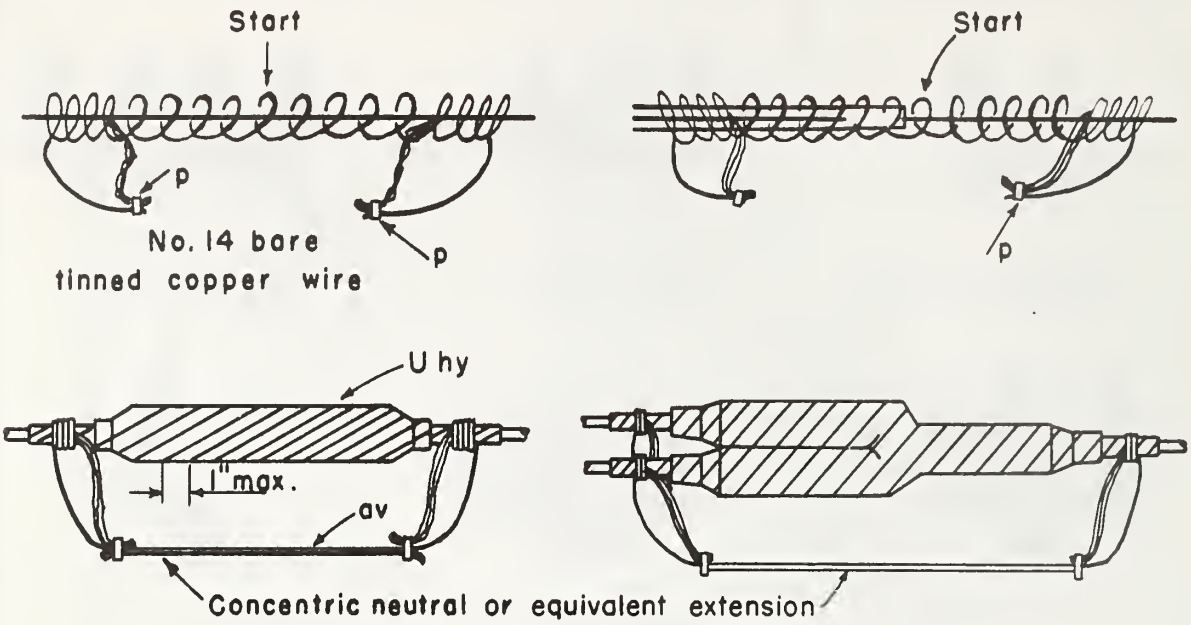
UM 40 - (2-2)

Example :

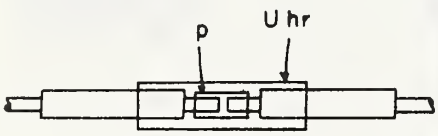
UM 40 - (2-1) designates a termination with two cable termination points and one load break point.

MULTIPOINT TERMINATIONS

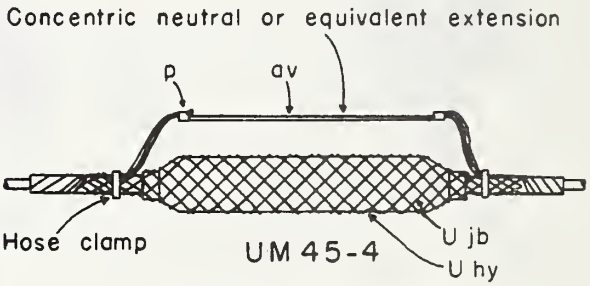
Dec. 1974 UM 40 - ( )



UM45-1 PRIMARY SPLICES UM45-2



UM 45-3
SECONDARY SPLICE



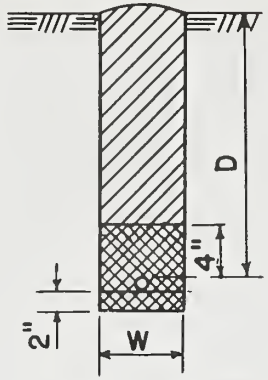
UM 45-4
PRIMARY SPLICE

		ASSEMBLY UNIT			
ITEM	MATERIAL	UM45-1	UM45-2	UM45-3	UM45-4
p	Connectors	as req'd	as req'd	1	as req'd
av	Jumpers	as req'd	as req'd		as req'd
U hr	Splice cover			1	
U hy	Splice, underground, permanent	1	1		1
U jb	Splice shield				1
	Hose clamps (stainless steel)				2

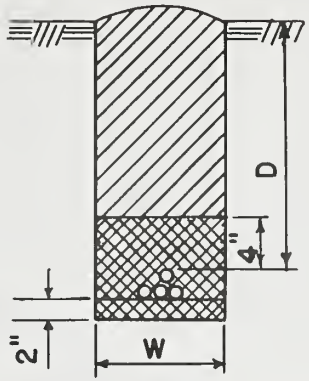
PRIMARY AND SECONDARY CABLE SPLICES

Dec. 1974

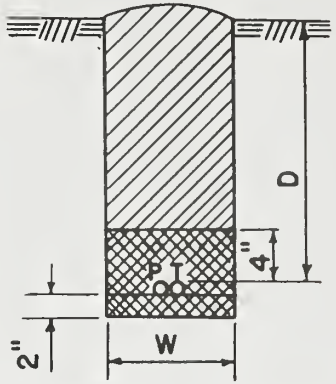
UM45-1, UM45-2, UM45-3, UM45-4



UR2 (D x W)
Trenching Unit
One Cable or
Cable Assembly



UR2-1 (D x W)
Trenching Unit
Multiple Power Cables
Primary, Secondary or Service



UR2-2 (D x W)
Trenching Unit
Power and Telephone Cable
Random separation

NOTES:

1. Depth (D) and width (W) are specified in description of units.
2. Depths specified are to finished grade.
3. Over-excavate trenches as necessary to allow for (a) sand bedding or (b) loose sandy soils or (c) where more than one cable will be installed in trench and laying of first cable may cause trench damage and reduction in depth.
4. Sand bedding is not part of these units and will be specified as needed for UR2 trenches.
5. Backfilling is part of all trenching units including joint-use trenches.

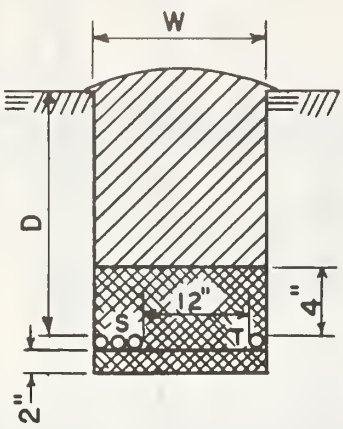
LEGEND

Sand or clean soil.

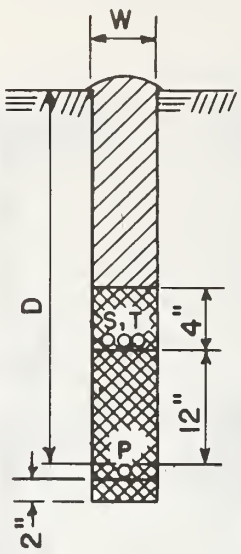
Undisturbed earth.

Wheel compacted backfill unless otherwise specified.

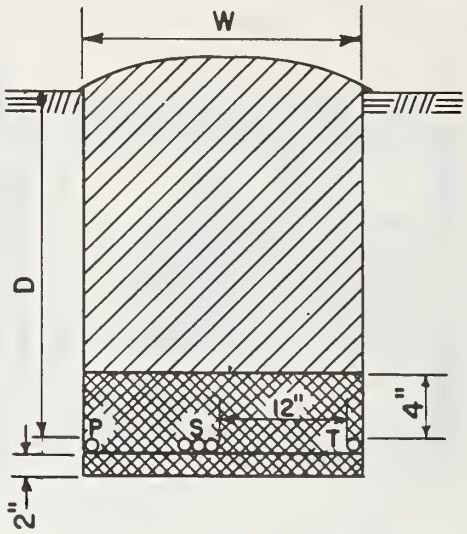
TRENCHES FOR DIRECT BURIAL CABLES		
Dec. 1974		UR2 TO UR2-2



UR2-3 (D x W)
Service or Secondary and Telephone



UR2-4 (D x W)
Primary and Secondary or Telephone



UR2-5 (D x W)
Primary, Secandary and Telephane

NOTES:

1. Depth (D) and width (W) are specifled in description af units.
2. Depths specified are to finished grade.
3. Over-excavate trenches as necessary ta allaw far (a) sand bedding or (b) laase and sandy sails ar (c) where more than ane cable will be installed in trench and laying af first cable may cause trench damage and reductian in depth.
4. Sand bedding is nat part of these units and will be specified as needed.
5. Backfilling is part of all trenching units including joint-use trenches.

Bedding Sand ar Clean Sail

Undisturbed Earth

Wheel Compacted Backfill Unless Otherwise Specified

TRENCHES FOR DIRECT BURIAL CABLES		
Dec. 1974		UR2-3 TO UR2-5